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MECHANIX ILLUSTRATED

VOL. XXIX NO. 2

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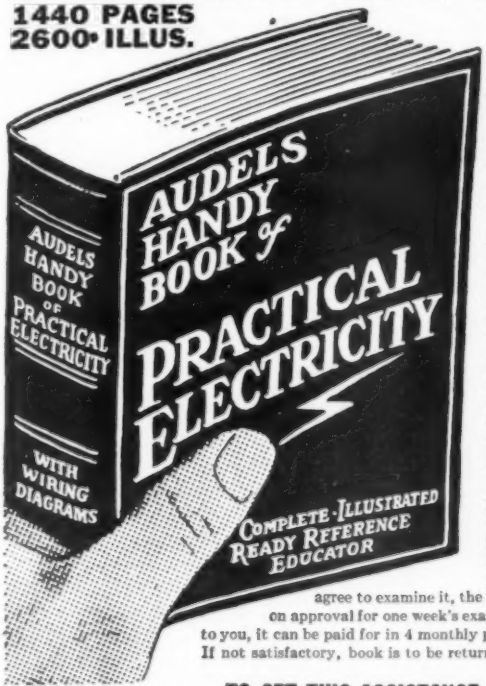

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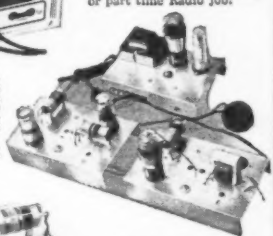

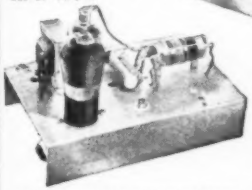

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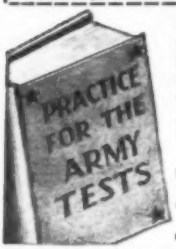

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BELIEVE it or not—the girls are sizing you up *all day long!* Whether they look at you TWICE is up to YOU! They *will* if you have a rugged, healthy big-muscled HE-MAN body, glowing with strength and vigor. But they'll just snicker at you behind your back if you're a skinny, no-muscle WEAKLING! If YOU, too, want to feel those admiring glances right through your back then listen to this:

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WILL you give me just 15 minutes a day of your spare time? That's all I need to PROVE—regardless of how old or young you are, or how ashamed you may be of your present physique—that I can give you a body men envy and women admire. Biceps that can dish it out, and a muscle-ridged stomach that can take it. A full, deep barrel-chest. Legs that never tire. A tough, sinewy back. An all-around physique that can laugh at ANY kind of rough going.

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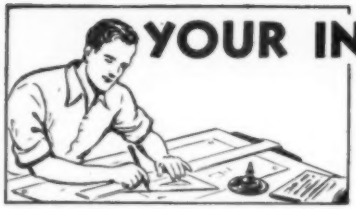

YOUR INVENTION CLINIC

Conducted by

JOSEPH H. KRAUS

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Because of the great number of letters he receives each month, he cannot attempt to send personal letters to all who write him, but must confine his replies to those which he can answer in his column. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed on inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Needs Use of Machine Shop

Carl K. Miller of Springfield, Ohio, writes: "I have several ideas which should prove decisive contributions toward winning the war. Although I am a machinist employed by the U. S. Government on an Army post, priorities regulations prevent me from having the needed experimental work done for demonstration models; nor may I do so on my own time at the shop. Can you offer any suggestions?"

ANSWER: *Perhaps there is a local hobby enthusiast with ample machine shop facilities who will be glad to make this equipment available for your use. Perhaps, in exchange, you can do some machine work for him if he does not now have the time to get at it himself.*

If any reader of this column would like to help this machinist and perhaps our country, we will be glad to forward communications to Mr. Miller directly. Address him in care of "Your Patent Clinic."

Sound Gun

Charles P. Jeffers, Bidwell, Ohio, submits drawings of a gun which depends for its destructive force on the sound which is emitted. He asks for an expression of opinion.

ANSWER: *The theory that high velocity sound waves are very destructive remains just a theory. Even the concussive force of huge "block buster" bombs has not been damaging to all within hearing range.*

Although it is true that supersonics of so efficient power, properly applied, are damaging to tissue cells, the problem remains of developing a method for applying the force over a relatively long period of time and directly to the opposing forces. This is not possible with your designed unit, nor is the frequency high enough for practical application.

Rotary Landing Arm

Eugene Seewald, New York, N. Y., submits two designs for landing airplanes in a small area. The nature of one of the constructions is indicated in the answer. The other is a modification thereof.

ANSWER: *A swinging beam under which an airplane can hook itself is not as "screwy" a thought as you believe it to be. As a matter of fact, this same suggestion was proposed and published in 1917, not only for landing planes but also for takeoff.*

Unfortunately, in the design of which you believe you are the originator, you have forgotten that the long yard arm to which the airplane is to attach itself has a certain amount of inertia. This arm must be put into motion immediately and with the speed of the moving plane at the moment of contact otherwise a crackup will result. You have outlined no method for doing this. In the planes published before you were born, a motor-drive set this arm in motion and after the plane was securely captured the motor was turned off, thus bringing the airplane to a gradual halt.

We feel that your designs are old and not as practical as those previously proposed. Further action would be indicated only if you can make present designs more practicable.

Fountain Pen

John Gergely, Ecorse, Mich., submits an idea of a sacless fountain pen of unique design and properties. Because we believe that this invention holds considerable merit, full details are not disclosed.

ANSWER: *Before proceeding with this idea, it is advisable that you make a number of models. No great amount of skill will be needed to do this. In fact, some of the pens now on the market could be modified to your changed design.*

Remember, however, that unless you develop some cheap methods for producing the ink in the style demanded by this pen, this article will be very expensive to maintain. This maintenance expense will more than offset any added convenience.

Our suggestion is that you have a patent search made to determine if this item can be protected fully; that you have models made; and that as soon as the production methods are developed fully you submit the idea to leading pen manufacturers after protecting with a patent. It is not likely that you, as an individual, could manufacture the pens and sell them in a quantity sufficient to justify tooling costs.

[Continued on page 169]

"THE RUDDER'S GONE, SIR!"

● **Fateful moment — when a ship loses its rudder! Then a great hulk drifts helplessly — and unless aid comes, that ship goes "on the rocks."**

There are *men* who drift all their lives. Is it surprising that these rudderless souls end up "on the rocks"?

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Chips FROM THE Editor's Workbench

Model-building fans are enthusiastic about the M-3 tank plans presented in August MI. For example, Franklin Kral of 519 S. Tulane avenue, Albuquerque, N. Mex., who built the model M-3 above which wins him this month's top award of $5.00 and a Certificate of Merit, says, "The model certainly performs like the real article and has power to spare. It was not difficult to build." He hounded local music stores to get sprockets and chain! Kral has four hobbies: radio, astronomy, model railroads, model airplanes. He adds, "However, I will build anything that can be built in a 10 x 18 foot room and taken through the door!"

Roto In Toto

MI HAS had her face lifted, in this issue, and as you turn her super-roto pages to the Hobbies section we think you will agree that she has never been more beautiful! For a surprise awaits you as your eager thumb whirs into this department—gone is the pulp paper, replaced with brilliant rotogravure stock plus all the clarity and tone of reproduction its use permits. Photos, photos and more photos—action, step-by-step, assembly, finished projects—that will be the keynote of the new bigger and better Crafts & Hobbies section; fifty-nine pages of the swellest stuff you hobbyists and home craftsmen have ever laid eyes on in *any* mechanical magazine. And don't think we're letting up on the plans and drawings either, because we aren't; they'll be there, too, enhanced and improved by the roto process, with tone and shading impossible heretofore.

Even if you weren't already convinced that MI was your favorite magazine, and by far the best buy in the mechanical field, we think you will be after you look over the copy you hold in your hand—and the price you have noted is still only 10 cents!

What Not To Invent

UNCLE SAM can tell you one invention that you don't need to try to invent. It is the idea of how to help win the war most often suggested to the National Inventors Council.

This popular device is a net or screen to protect ships against torpedoes.

The National Inventors Council, in announcing that 100,000 ideas have been submitted to it by our nation of inventors, explained that several thousand of these were devices for protecting ships against torpedoes.

Because this field of invention has had such intensive consideration, it is suggested that inventors would be wise to direct their efforts to a less developed category of inventions.

During the last World War, the Naval Consulting Board received 6,740 similar suggestions. Of their defensive value, this Board said:

"Up to the present time not one of these proposals involving screens of any kind has received the approval of the Navy Department or of the merchant marine. The principal objections offered to these devices are that they are heavy, difficult to hold in position, unmanageable in a heavy sea, and that they interfere with the speed and with the ability of the vessel to maneuver—the immunity of a vessel to submarine attack is dependent very largely on its speed and also its maneuvering ability."

Something New Has Been Added

IN last month's MI Crafts & Hobbies section many of you sharp-eyed readers probably noticed an innovation—in fact, we don't see how you could have missed it since it covered two whole pages—in the presentation of a How-to-build project. We refer, of course, to the new and

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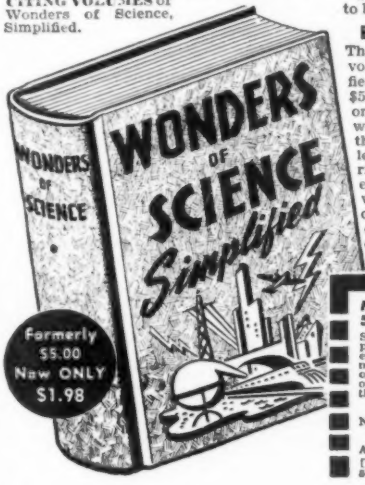

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Editor's Workbench Chips

scintillating cartoon character Bill Bildit, who, while in the midst of subterranean trials and tribulations in his cellar workshop, shows you how to create something useful with your own pudgy little hands. He is at once an instructor, ardent hobbyist and humorist, and we predict a great future for him; he may even, in time, replace Blondie as the national favorite. Anyway, we hope you'll like him, and let us know about it. You'll find him this month on page 116, putting the foil on Grandpa.

Bad News

WE REPORTED last month that, on the day MI hit the newsstands bearing a kodachrome of Lieutenant Roland Kachinsky, Marine paratrooper, on the cover, Lieutenant Kachinsky was reported killed in action in the Solomon Islands. We are sad to have to report that more bad news has since been added to that story. In the same story on Marine paratroopers in October MI, we printed a photograph of Sergeant J. F. Hennessy. Strangely enough, it was printed next to that of Lieutenant Kachinsky. Now we learn that Sergeant Hennessy was killed in action in the same battle—at the side of Lieutenant Kachinsky.

Book Dep't.

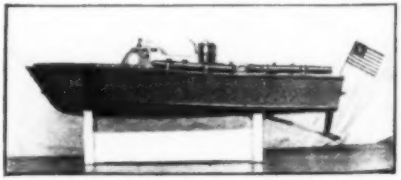
WILLY LEY, noted war weapons expert and scientist, whose article, "The New Era of Super Guns," appears on page 58 of this issue, is the author of a new book just published by The Viking Press, entitled, *Shells and Shooting*. It's about as thorough and intriguing a presentation of the science of shooting that we've ever seen. We recommend it, if your interests run that way.

How-To-Do Man

PROBABLY no MI contributor is better known to readers than Hi Sibley, who has been providing its pages with an almost unbelievable

[*Continued on page* 19]

"... SHE REALLY GOES"



Carl Rider, of 232 Frederick St., Hagerstown, Md., is the builder of this model PT boat from MI plans. "It is powered with an Ohlison 60 special motor," Carl writes, "and she really goes." He hasn't opened her up all the way yet—he wants to try her out a few more times first. It's wise to make a few tests before a full speed run. A $3.00 Workbench award and a Certificate of Merit go to Mr. Rider for this snapshot of his model.

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Editor's Workbench Chips

[*Continued from page 16*]

quantity and variety of excellent how-to-builds for the past number of years. Whether it is a boat or a new type of scooter, Hi can design it expertly and build it, too, if necessary. He is an accomplished artist, draftsman and author, with a knack of explaining clearly, in few words, whatever is necessary to supplement his virtually self-explanatory sketches. He is also a practical builder of long experience, his latest little project being his new home; a complete ranchhouse constructed with the aid of his husky son, Sib, Jr.

We hope that Hi's interesting and original ideas will long continue to delight MI's hobby enthusiasts and craftsmen readers, and his articles will show to better advantage than ever with the new roto paper in the How-To-Build department.

A World You Never Knew

THIS month MI presents the third in it series, "A World You Never Knew," beginning on page 70. This time it's about the marvelous new household machinery that's coming after we gain Victory. In case you have missed the first two articles in this series, we'd better explain again what the theme of the series is all about.

MI sent questionnaries to thousands of manufacturers over the country asking them what new methods and materials were being developed under the pressure of wartime research and how these new methods and materials would affect their new peacetime products after the war is finished. The information we turned up was amazing, to say the least. There was hardly a manufacturer who replied who did not say that the war was going to revolutionize his business.

Science Writer Donald G. Cooley took the information gained from this survey and correlated it with information he had gained in independent research. MI then retained the noted New York firm of Industrial Designers, Martial & Scull, to go over this information and draw designs visual-

[*Continued on page 21*]

WINTER ON SUMMER STREET

With a speed of 95 miles an hour, it's logical that this iceplane was built by George Swift. Mr. Swift lives at 39 Summer Street, Holliston, Mass. About four months' work went into the construction job of this 325-pound single seater, but the thrill of driving it across the ice at a mile and a half a minute must make it well worth the trouble. The engine is a Heath B-4 airplane motor. This snapshot brings Mr. Swift a $3.00 Workbench award and a Certificate of Merit.

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Editor's Workbench Chips

[*Continued from page* 19]

izing the new world of mechanics that's coming after the war. The result: About as interesting a series of articles as MI has ever presented, we think you will agree.

It is beginning to be evident, too, that MI was out in front of a trend when it conceived this series. Dozens of advertisers are beginning to pick up the same theme. One outstanding example is the series of ads entitled, "Look Ahead," prepared by the Van Auken-Ragland advertising agency of Chicago for the Food Machinery Corporation. You probably will be seeing this series in various national magazines soon, and we think you will be surprised at how close their ideas of the world of the future parallel ours. Again, the Marshall Field store in Chicago, the world's largest store of its type, is displaying on its main floor currently a visualization of "The World We Are Fighting For," and it has seen fit to borrow a number of the original sketches from MI's series to help illustrate this display. Altogether, we are highly flattered.

So if you haven't started the "World You Never Knew" series before this, please hop right onto page 70 and get in the swim!

Next month, incidentally, our "World You Never Knew" series will bring you a picture of the coming marvels of transportation which will result from the lessons of global transportation we are learning in this war. You'll see Henry J. Kaiser's great cargo planes—flying boxcars; you'll see glider trains of the future, new transcontinental trains of incredible speed, new wonders of highway control, and a world of other amazing things

[*Continued on page* 23]

SOMETHING NEW ADDED

Arlie Toulouse, of 385 Bay, Costa Mesa, California, built this specially appointed *Jitterbug* from plans in HOW TO BUILD 20 BOATS. She's shown here before her mast was stepped, but since then she's had plenty of sailing. "She can beat most racing hulls in a light breeze—" writes Mr. Toulouse. The rail structure on the stern is a special outboard mounting that permits the motor to be tilted up onto the deck when under sail. A $3.00 Workbench award and a Certificate of Merit go to Mr. Toulouse for this snapshot.

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Editor's Workbench Chips

[*Continued from page 21*]

that will be actualities soon after peace comes. It's going to be one of MI's most exciting stories, so we advise you to reserve your copy of January MI at your local newsstand now. It'll be on sale soon after December 1.

And, while we're on the subject, we want once more to remind you that this world of the future will never be ours *unless we first win this war.* From a purely selfish standpoint, you should be buying War Saving Stamps and War Bonds now to help win the war. It will bring this wonderful world closer—and it will enable you to save up your money so that you can buy the new marvels when they get into production! Shell out now, boys, for "The World You Never Knew!"

Drum Talk

YOU'VE heard of the mysterious "drum talk" of the jungles of Africa. You know the mystery of the jungle telegraph has never been explained. Would you like to learn the secret of it? Then we want to call your attention particularly to an article we will print in the January issue of MI. It will be titled, "Drum Talk," and it's written by Dr. I. A. Good, who has lived in West Africa for many years as a missionary. It is published by arrangement with *Natural History Magazine*, the official publication of the Museum of National History of New York. It explains away the mystery of the jungle telegraph for the first time. Don't miss it!

[*Continued on page 25*]

COST, WITH PADDLE: $8.50

The competent young paddler in the neat, rakish kayak above is Wayne Klausman of 1519 Aldrich Ave., North Minneapolis, Minn., who built the fast little craft in just two weeks from plans in MI. He writes, "The cost of my kayak complete with double paddle was $8.50. I have one inner-tube in compartment in front of the seat and one back of it. My kayak cannot be sunk. I am going to mount a sail on it next." In recognition of young Klausman's ambition and skill, he is awarded $3.00 and a Certificate of Merit.

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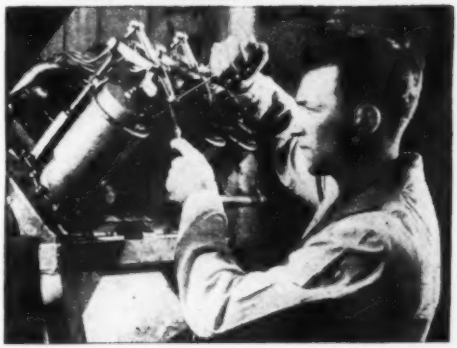

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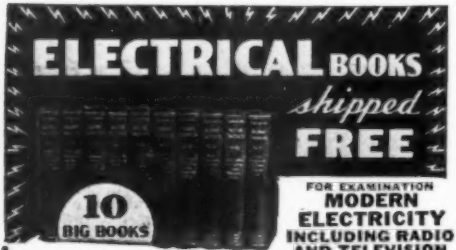

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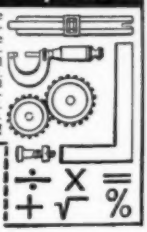

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Editor's Workbench Chips

[*Continued from page 23*]

Air Tummy

IF YOU'RE a student flyer and are troubled with air-sickness, we'd advise you to read the following rules by Lieut. T. T. Flaherty of the U. S. Navy Medical Corps.

Here is what you should do on your next wing-over if you want to avoid that pea-green feeling:

1. Adjust the seat to a high position for maximum visibility, being careful, however, that this does not interfere with full throw of the rudder paddles.

2. Fasten the safety belt firmly, thus minimizing "bouncing" and going a long way toward making plane and pilot one, even as the good rider makes himself a part of the horse.

3. Refrain from staring at the instrument board. Rather, he should keep his eyes out of the cockpit as much as possible.

4. Most important, pick out some point of reference—a sort of guide-post—a long way off. In loops, spins, Immelmann turns, wingovers and other maneuvers, keep your eyes off the nose and wings of your plane. Take a straight stretch of roadway, fence line or even a point on the horizon as an alignment guide. Most students who became airsick during wingovers spent a great deal of time looking in the cockpit at the air-speed meter, and the "needle and ball" indicator, literally flying mechanically by instruments with no points of reference on the earth's surface ever being used. In snap rolls, a point on the horizon or a cloud bank could be taken as a point of reference. This point can be followed during the maneuver and the student will know his position throughout the roll.

5. Avoid executing the same acrobatic over and over as this tends to cause airsickness to a far greater extent than if you vary them, and to

[*Continued on page 33*]

This handsome clock would be a credit to the most experienced cabinet-maker, judging by the photograph, but it was made by a motion picture camera man in the course of his hobby. The maker is R. O. Binger, of 5645 Topanga Canyon Blvd., Canoga Park, Cal. The intricate carving was done by Mr. Binger with tools he made from drill rod and tool steel. The clock movement, itself, however, was purchased ready made and then installed in the clock cabinet. The carved bellows was also made by Mr. Binger.

The Binger home workshop is one that any hobbyist would like to have. It contains a bench saw, band saw, drill press, air compressor, wood lathe, metal lathe, high speed grinder, hand motor tool, and foundry furnace. It's quite apparent that Mr. Binger knows how to make good use of his shop equipment. This snapshot of his clock brings him a $3.00 Workbench award and a Certificate of Merit.

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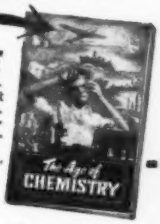

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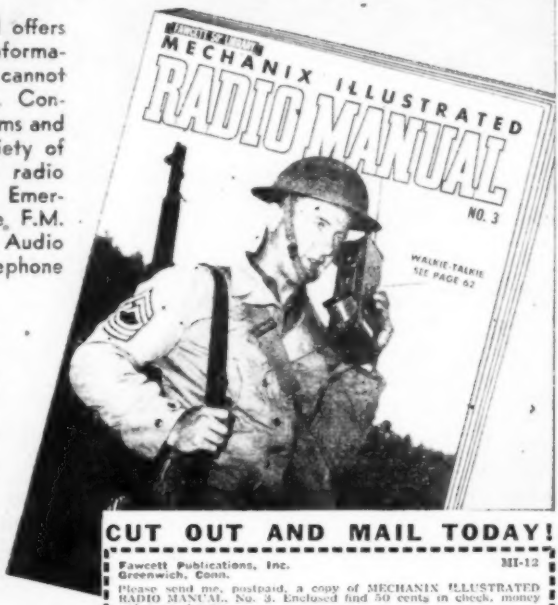

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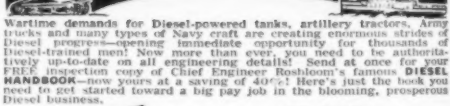

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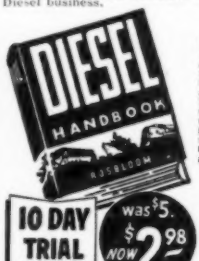

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Editor's Workbench Chips

[*Continued from page 25*]

wait a short interval between different acrobatics.

6. Never attempt a landing if extremely airsick, remaining at a reasonable altitude in level flight until the spell is subsided.

"Airsickness in most students during acrobatics is caused by their poor orientation in space," the navel surgeon concludes. "Airsickness can ordinarily be overcome when a student becomes oriented in the air by using his eyes to pick up points of reference on the ground."

Dancers, he pointed out, prevent dizziness by focusing momentarily on a certain point in the audience or on the wall as they complete each revolution in a whirl.

10-FT. WING PLANE "DOING FINE"

A few years ago MI published plans of the XP-3, gas-powered model plane. Ray Sekera, *above*, of 583 Oliver street, North Tonawanda, N. Y., came across the issue and decided to build a model from the plans —and you see the result here. "It's doing fine," Sekera writes. He spent two months building the XP-3, which has a 10-ft. wingspan and 1/5 horsepower motor. His perseverance and workmanship earn Sekera a $3.00 check and a Certificate of Merit.

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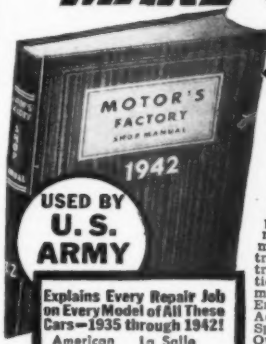

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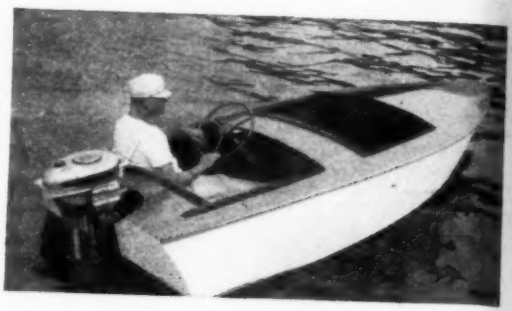
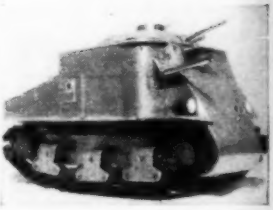
BOAT: *Frisky, left,* is a popular 17-foot Marconi rigged sloop that can be constructed of non-defense materials. *Blueprint No. 972, $2.50.*



BOAT: Above is *Sportster,* a speedy 12½-foot outboard runabout. Will take any motor of from ten to thirty h.p. *No. 978, $1.50.*

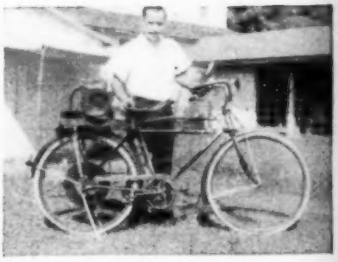


MODEL: Build an accurate scale model of one of the U. S. Navy's "T" Class submarines, pictured *below.* Plans include full-sized templates for hull. *Blueprint No. 336, Price $1.50.*

MODEL: An electrically driven replica of the famous M-3 General Grant tank that maneuvers like the real thing by remote control. *No. 337, $2.00.*

MODEL, *below:* Here's an action model that will give any boat model fan the thrill of a lifetime. You guessed it—a 26-in. model PT motor torpedo boat like the one Lt. Bulkeley smashed the Japs with. Completely detailed and powered with a midget gas engine. *Blueprint No. 330, Price $2.50.*

MOTORBIKE, *right:* The answer to rubber and gas rationing. If you own a bicycle you can install a small motor that will push you comfortably along on practically no gas! Plans show two types of installation, and include a bike sidecar. *Blueprint No. H-82, Price $1.00.*



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by James D. Cross,
Combat Pilot of the American Volunteer Group

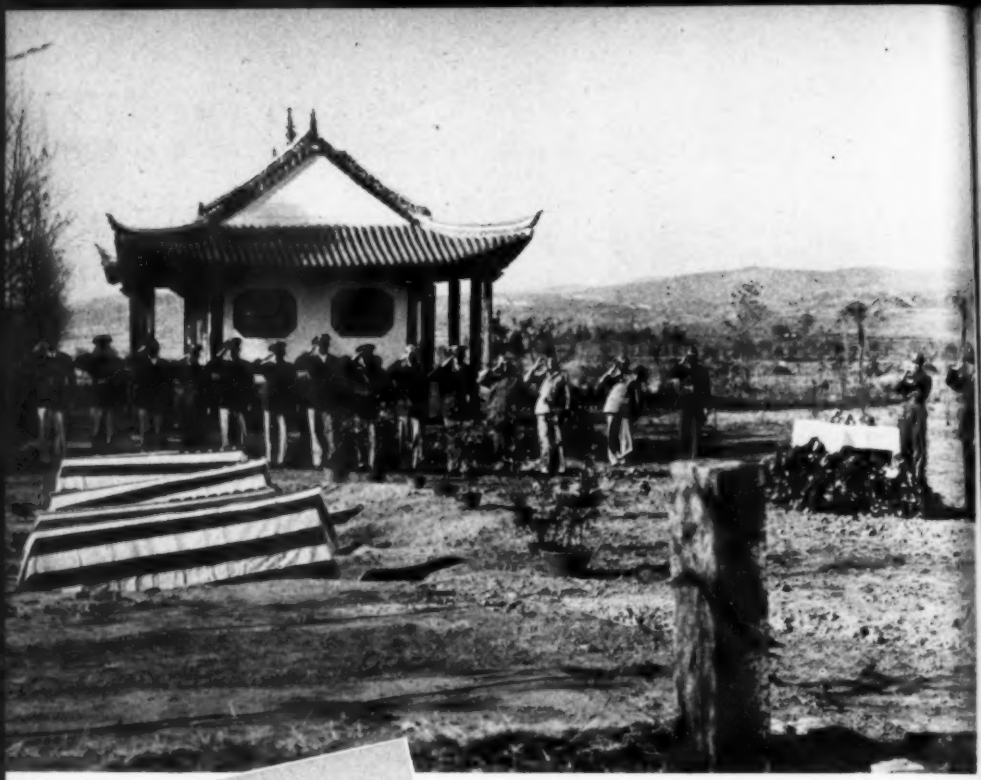
I DID my stretch as a pilot of a Flying Fortress at McDill Field in Tampa, Florida. I was a second lieutenant, twenty-two years old and still a little moist behind the ears after getting out of Moberly College. That B-17 was some job, and it was a thrill taking it up and settling it down again.

Later on I spent some time as a ferry pilot on Lockheed-Hudsons. By the time I arrived in Burma, in November of 1941, to join up with Col. Claire Chennault's outfit as a fighting pilot, I figured I knew what the score was. I'd had plenty of hours in the air back of me, I'd been at the controls of a score of planes of one type or another, I'd had my share of close calls.

I remember the first time I looked over the P-40 which I was going to fly for the American Volunteers Group and China. A sweet looking job. The big Allison air-cooled engine looked plenty powerful. The firing power, two .30 caliber fast firing machine guns in each wing and two .50 caliber babies synchronized to fire through the prop, made me feel fine. I began to feel almost sorry for the Japs. Those Mitsubishis —lumbering, two-engined bombers—should be setups. Even the Zero fighters, I figured, wouldn't be too tough.

Already I had learned that the Zeros were

Pilot James D. Cross was one of Brigadier General Claire L. Chennault's American Volunteer Group which won itself everlasting fame for its heroic action in the air against the Japanese over Burma, under the command of the Chinese Army. A native of Huntsville, Mo., Pilot Cross was a second lieutenant in the Army Air Corps when he joined the A. V. G. This is his first person story of the exploits of the famous Flying Tigers of Burma.



The Flying Tigers pay last tribute to three of their members killed by the Japanese gunners over Burma.

fast, but they had virtually no armor, only fair firing power, and whereas they were highly maneuverable, if a pilot threw them into a fast dive, he'd tear the wings right off them. I was anxious to get started.

But it wasn't that simple.

During that first month with the Flying Tigers, I spent most of my time unlearning all the things I had previously learned about combat fighting. I wasn't the only one, in those first days while we were stationed at Toungo in a field which was little more than a sort of dried out rice paddy, to wonder why Chennault bothered with the endless practice flights, the tedious lessons in formation and the deadly routine of repeated courses in theory. Later on I wasn't the only one to realize that it was the training of those first weeks which was responsible for saving my life more times than one. Chennault knew, from the very beginning, how badly we were going to be outnumbered; he also knew that the little yellow bellies were tough pilots.

We were all anxious to get in contact with the Japs, and I know that a lot of us would have been about ready to throw up the sponge in disgust if it hadn't been for that $600 a month salary and the $500 bonus promised for each plane we brought down. We couldn't understand the endless hours of formation flying, the dullness of constant study and constant practice. We wanted action. And then suddenly, we got action!

The tension really became something after Pearl Harbor. We were more anxious than ever to get started. But it wasn't until December 20th that the group I was with got their first taste of blood.

We were stationed in Yunaan at the time, our operational headquarters working in direct contact with General Chiang Kai-shek's headquarters in Chungking. It was an early afternoon when the first alert came in.

A Jap bombing formation had been picked up in the net. The net was formed in a concentric circle with Chinese telephonists as observers at the outer rim of the circle some hundreds of miles from our camouflaged air

A squadron of the American pilots line up before one of their famous shark-faced Curtiss P-40's in Burma.

base. An inner circle was made up of American observers, radio and telephone operators who would be stationed as far as two hundred miles away from us in the wilderness. Right now I'd like to hand those boys a wreath or so for sheer valour.

Their job was not as spectacular as ours—they weren't pilots and most of them weren't fliers. But it takes real guts to stay miles out in a jungle, for days on end, without company, keeping a constant eye alert for not only enemies in the air, but enemies on the ground, as well. When they took an assignment, they never were sure if they would end up in enemy territory and behind enemy lines or not. They were sure of one thing, however. In case of trouble they would be strictly on their own.

Should they be subject to a surprise attack, there was no way in the world help could reach them. They knew there was every danger that they'd fall into Jap hands. And in China the feeling was that it would be a better break to be shot down in a plane than to be taken alive by the Japs. If there are any unsung heroes, they were the ones, all right.

I was on the dawn patrol, wingman to Fritz Wolf, a truly great combat pilot. We had made our first take-off well before daylight, but it proved to be a false alarm. A little later, after breakfast, I was smoking a cigarette while we were lined up on the field, our planes being periodically warmed up. It was then that Operations again called. The message was terse.

"Jap bombing formations picked up in net—heading this way!"

We lined up on the field, while the planes were warming up. Our eyes were glued for the green rocket which would signal false alarm—or the red rocket which would be the order to take off. It was the red rocket this time.

We circled, getting altitude as quickly as possible. Went up to around 16,000, a good place to start using the oxygen mask, before we levelled off and started for the place where we figured we'd meet the bombers. It's

Pilot James Cross, the author, snapped in his P-40 about to take off for a combat flight.

And here's what happens to naughty little Nips who presume to go up against the A.V.G. This is the wreck of a Nipponese heavy bomber.

strange how big the sky really is, once you get up there. No trick at all to completely miss a bomber formation, even though it may be only a couple of miles or so out of the path.

Operations was keeping in constant touch with Sandell, our flight leader. My own head was constantly rolling, back and forth and sideways. We weren't going to be surprised if we could help it. It was bitter cold and my shield was already frosted. And then, just as we pulled out of a thick cumulus cloud, we spotted them! Tough looking babies with machine gun blisters ahead of their tail assemblies. Two engined-bombers with round orange suns on their wings. Mitsubishis! They were right below us. And there were no fighters accompanying them.

They were faster than I thought they'd be. It took us fifteen minutes to get in position to peel off. And then suddenly Sandell waggled his wings and went over. Wolf followed him like a shot. A second later and my own Allison was howling and screaming as I dove her.

There was the Jap plane, dead in front of me. I could see the sun glinting on the gunner's goggles.

That first time it was all automatic. I saw my own tracer fire almost before I realized I'd pressed the button. The sky about me was ribboned with criss-cross fire. I waited a split second before letting go with another burst. Waited until I saw the engines of the bomber right in front of my ring sight. I remembered that we'd been taught to shoot for the engines if possible. Over mountainous country like this, you were sure that if you got their engines they'd be dead pigeons.

Five hundred miles an hour is plenty fast. That's what I was doing as I passed the bomber. But I'd seen my tracers burying themselves in it. By the time I'd levelled off and then zoomed up behind my flight leader, the Japs were miles away. But we still had another crack at them. That is the six out of the original ten which were still left.

Once more it was repeated. The confusion, the screams and the roar of racing, diving Allisons. Even the sounds of the guns were lost in that.

I don't know today whether I got one or two planes, or none. I do know that I got hits on two. But the chances are better that Wolf actually brought them down. The flight leader always gets more hits and he should get the credit.

One thing I am sure of, as far as that first combat is concerned. The sudden *wham*, as an enemy .30 caliber slug tore into my crate, some six inches from the windshield. It went right through the cowling and smashed my left .50 caliber gun.

Five of the others took slugs that day, but we were lucky. [*Continued on page* 154]

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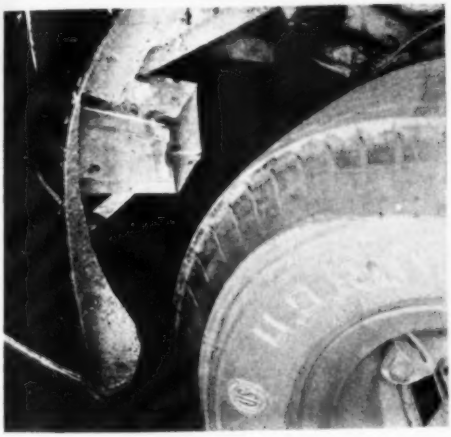
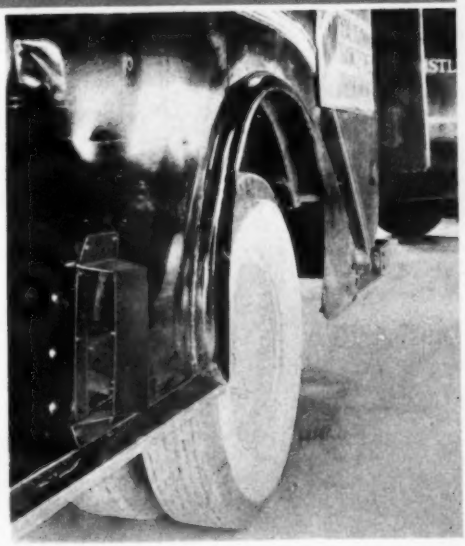
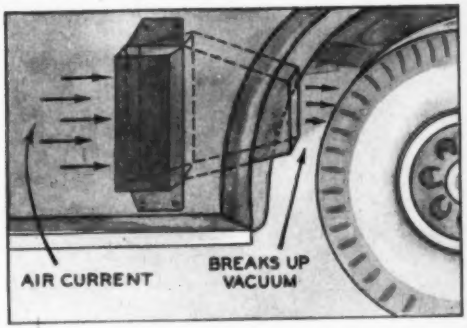
The simple scoop-ended ventilator before installed.





As the truck moves, air is scooped into the ventilator and flows coolingly onto the tires *(left)*, cutting deterioration.



by Paul Cain

LATEST idea in conserving rubber on rolling stock is a tire ventilator, designed to eliminate the heat factor in tire wear—a substantial though little-known contributor to high-speed wear. This reduction in heat deterioration is the result of an experiment by L. S. Vance of Oklahoma City, Okla.

Speculation as to the cause of heat punishment to dual tires has been rife ever since the earliest jobs wobbled down the road under overloads. Opinions have varied from the brake drum to the trailer hitch as the cause.

Observation convinced Vance that the primary cause of the trouble was a vacuum created between the dual tires in the deep recesses of the rear fenders while the vehicle is in motion. [*Continued on page* 183]

Inventor Douglas Winnek poses a subject for a depthful portrait.

COLOR PHOTOS IN THREE DIMENSIONS

by Andrew Giegold, Jr.

Conventional printing from the Trivision emulsion gives this result, but the blur becomes a three-dimensional picture when viewed through the Trivision lenticulated film base.

(Left) Cross-section, microscopic view of film. White area is film.

A MAN named Douglas F. Winnek has developed a photographic process for making portraits with all the advantages of sculpture and painting. Yes, it offers the *depth* of three dimensions, and *color* that's superior to a painter's because it's natural—in addition to the usual photography advantages of lower cost, quicked production, and convenience.

Heart of the method is (1) a unique

scanning camera that a motor moves across a stand so that it takes views from different angles but puts them all on the same film, and (2) film that looks like a small washboard. "It's simply lenticulated," Mr. Winnek says. (See diagram on this page.)

Portraits made by Mr. Winnek's invention, which he terms Trivision, are literally life-images of the subject, resembling the person so faithfully it seems a living thing. The observer is convinced he could reach out and touch the pictured individual.

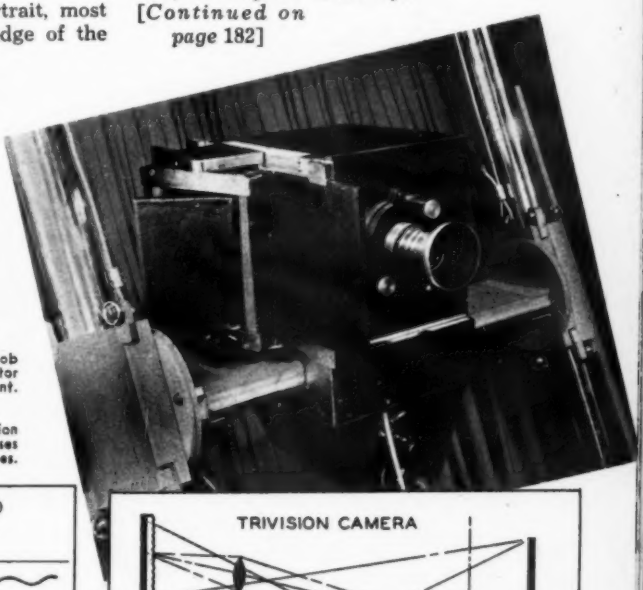
On first seeing a Trivision portrait, most persons instinctively finger the edge of the photo, thinking that at least four or five transparencies must be glued together to give the impression of depth. But the transparency (paper prints are expected to be the next step) is only a 1/100-inch thick piece of film.

Trivision is well beyond the experimental period. Anyone can go to the Winnek studio in Mount Vernon, N. Y., now and sit for his portrait in three dimensions. Cost is low, too: $10.00 each for 5x7-inch natural-color portraits, $5.00 each for black-and-whites. Shortly this portraiture process will be available through other studios when paper prints are perfected. Technique in taking and processing these pictures is the same as in ordinary photography.

Let me explain the principles which lie behind Mr. Winnek's amazing invention:

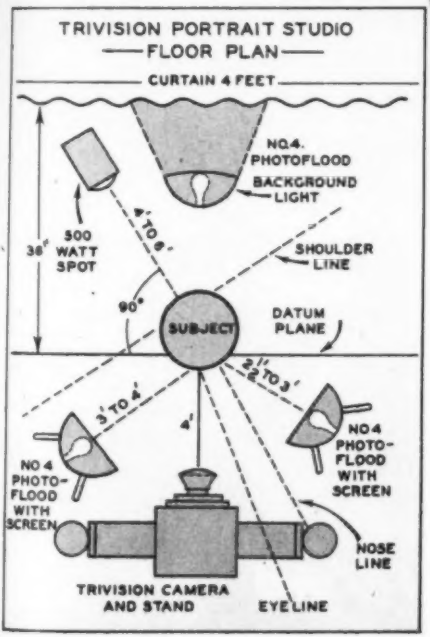
Anyone with two eyes sees third dimension, or depth. Each eye

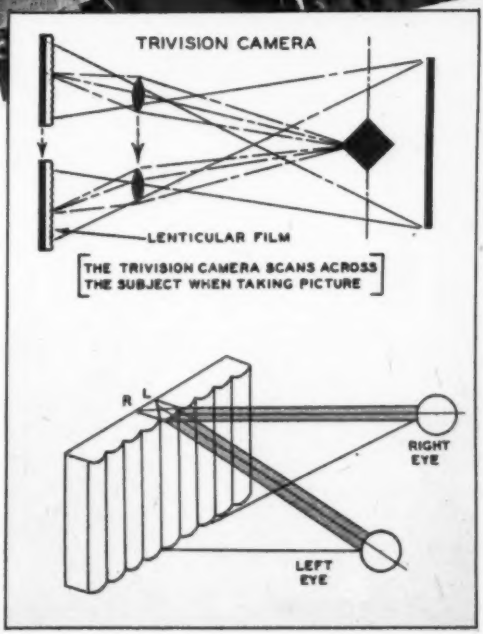
[*Continued on page* 182]



Trivision camera mounted on studio stand. Knob and dial comprise datum plane selector. Motor below camera powers its scanning movement.

(Below) How lights and camera are placed for Trivision portraiture. *(Right below)* Trivision camera in effect fuses images seen by the eyes.





CAMOUFLAGE NEW STYLE

An expert explains the new science of concealment in the war.

by Lester L. Wolff

National Adjutant,
American Camouflage Corps

After surveying a factory to be camouflaged, members of the ACC look on as Professor C. Hayes Sprague discusses a "visual" and plans concealment. The author, at right.

From aerial maps and survey data, an ACC member first makes the small model of a factory seen at left in photo below. A larger model (top) is then built for experiment.

WHO says the British have no sense of humor?

Not long ago, the Nazis went to considerable pains to camouflage one of their industrial cities in the Ruhr district of Germany. To add to the confusion, they built a dummy city in a field next to the real city, hoping to make R.A.F. bombers believe that the real city actually was about a mile away from its true site.

Aerial reconnaissance planes of the R.A.F. came over and took photographs of the Nazi city and the fake city. The camera's unemotional eye showed up the Nazi flim-flammery.

The R.A.F. big bombers came over the next night and blew up the *real* city, camouflage and all.

But then the R.A.F. pilots added a typical British gesture to their raid: They flew over the dummy Nazi city and dropped dummy British bombs on it, to show their contempt for the German camouflage methods!

The story of the dummy bombs dropped on the dummy city brought world-wide guffaws at this one instance of Nazi stupidity. But it had a serious side to it, too. It pointed out the fact that camouflage, which got its start in the first World War, has been completely revolutionized by new methods of aerial reconnaissance.

No longer is the camouflage artist—or camoufleur—concerned only with

eye-level concealment, or with concealment from the human eye only. Today the camouflaeur's object is to conceal against the all-seeing eye of the airplane observer and the mechanical eye of the aerial camera.

Camouflage was developed only during the last stages of World War I, and then only at the insistence of the French General Staff. Only a very small contingent of Americans received any training in the art of camouflage at that time. Then, with the Armistice, almost all research on the subject came to an end.

Consequently, when World War II opened, artists, engineers and other students had to start almost from scratch in originating and perfecting a science of camouflage.

The technique of World War I, as evolved in the last few months of that struggle, was based on the idea of "disruptive pattern." In other words, the artist splashed great streaks and geometric designs on the sides of objects to be camouflaged, hoping to confuse the eye of an enemy observer and make it impossible for him to discern the true outlines of what he was seeing. Everyone will remember the weird paint patterns which were spread on the sides of ships in World War I. Bright colors were used in many instances. In actual practice, this system of "camouflage" was found to be not a protective concealment at all, but, rather, a definite indication to the enemy of war activity.

With the coming of World War II, experts in this field immediately set to work to devise new methods of concealment, keeping in mind the fact that the aerial camera is a much sharper means of detecting fakery than the human eye. They found at once that, for instance, the human eye might be fooled by painting the roof of a factory green, to simulate foliage, but that green paint and green leaves look entirely different when photographed, using the infra-red wave-length. (Several cameras are in operation at the same time.)

They learned, too, that you might be able to paint the roof of a factory so that it looked like almost anything else—BUT that you couldn't change the shape of the shadow cast by that roof; not, at least, by means of paint.

Shadow elimination, therefore, became the foremost objective of the new style camou-

Pratt Institute-Museum of Modern Art

With the working models built by the ACC (see opposite page), experts experiment with various shadow-breaking materials until best result is obtained.

Syracuse University

Here is how experts camouflage three oil storage tank models (*left*) to make them look like a small grove around which a road curves. Tree-like "roofs" blend shadows into those of natural trees. Note dummy road extension.

fleurs. The aerial camera will unfailingly catch shadow patterns on the ground and will reveal the presence of a large factory building no matter how it is painted.

The second discovery made by camoufleurs was that color really made very little difference in concealment, anyhow. It was found through extensive tests that color, at high bombing altitudes in a plane, fades into a blue haze revealing only grays, blacks and whites.

These two facts—that shadow is all-important and color is of very little importance—made it plain that the camoufleur would have to work primarily to *alter shadow design* in order to conceal.

The U. S. Army started its Camouflage Corps at work on the problem. At once, however, it became apparent that there was need for another organization to work on camouflage problems on the home front—for this is a war that is fought not only at the front lines, but also at home, where munitions and weapons are produced, as the Nazis have found out to their great discomfort in the past months.

The need for an organization to grapple with problems of industrial camouflage led to the organization of The American Camouflage Corps, of which I am National Adjutant. The ACC is a purely volunteer organization, composed of civilian experts in fields allied to camouflage: artists, engineers, draftsmen, photographers, model makers and men with similar experience.

In New York, we have set up headquarters at the Hotel Mayflower, and a laboratory at the Hotel Knickerbocker. Our volunteer workers go into the field to study each individual problem. We are now organizing the ACC into a national corps and I appeal to all persons who wish to set up local civilian camouflage corps as units of the ACC to write to me at the Hotel Mayflower, New York, for full details. We are anxious to form volunteer units over the entire country.

The ACC is giving free advice on camouflage to owners of factories and other industrial establishments. Our members, when asked for such advice, first go into the field and photograph an establishment. From the photographs we make sketches showing typical shadow patterns cast by a factory. From these sketches we then make small models, bearing in mind all the accurate dimensions of the factory.

From the small models, we then have our experts construct working models,

Difference between World Wars I and II camouflage. Disruptive pattern on roof (*top*) still leaves identifying shadows.

Model of a storage tank, warehouse and siding—a perfect bomb target. Now see how it is concealed, *right*.

False roofs and tree-shaped planes make the fast-flying bombardier think he's seeing a civilian area.

Syracuse University

An Army reception center is a prime bombing objective and would be spotted from afar if its buildings were left as built, as above, in conspicuous neatness.

Syracuse University

Camouflaging can conceal part of the center, make the bombardier think the rest is a farm on which he wouldn't waste a bomb. Confusion of enemy is purpose.

on a larger scale. The working models are then photographed by aerial cameras in various lights, so that we may calculate the different types of light and shadow patterns cast by the structure. Then our experts go to work to determine how best these patterns can be altered.

This is done by using various types of materials to build out the roofs of the factory models so that shadow outlines can be altered.

In this connection, experts have found another most important factor in the new science of camouflage: Shadow patterns must be made to blend in with the surrounding territory. For instance, if a factory is located in a wooded area, its roof should be built out so that it casts shadows similar to those cast by the nearby trees. Or if a factory is in a district of small slum houses, false planes may be placed atop its roof to cast shadow patterns similar to those of the surrounding houses. The photographs which accompany this article illustrate the manner in which this is done.

Another new and important camouflage device developed in this war is the use of decoys. Bombers rely to a great extent on known landmarks, such as tall chimneys, etc., in locating their targets. In Europe, great use has been made of dummy chimneys, dummy buildings, etc., in order to confuse bombers. It is known that the Russians built a complete dummy city so successfully that it was bombed more than 1,000 times by the Nazis.

Before an installation is camouflaged by the ACC, a thorough analysis of the area is first made.

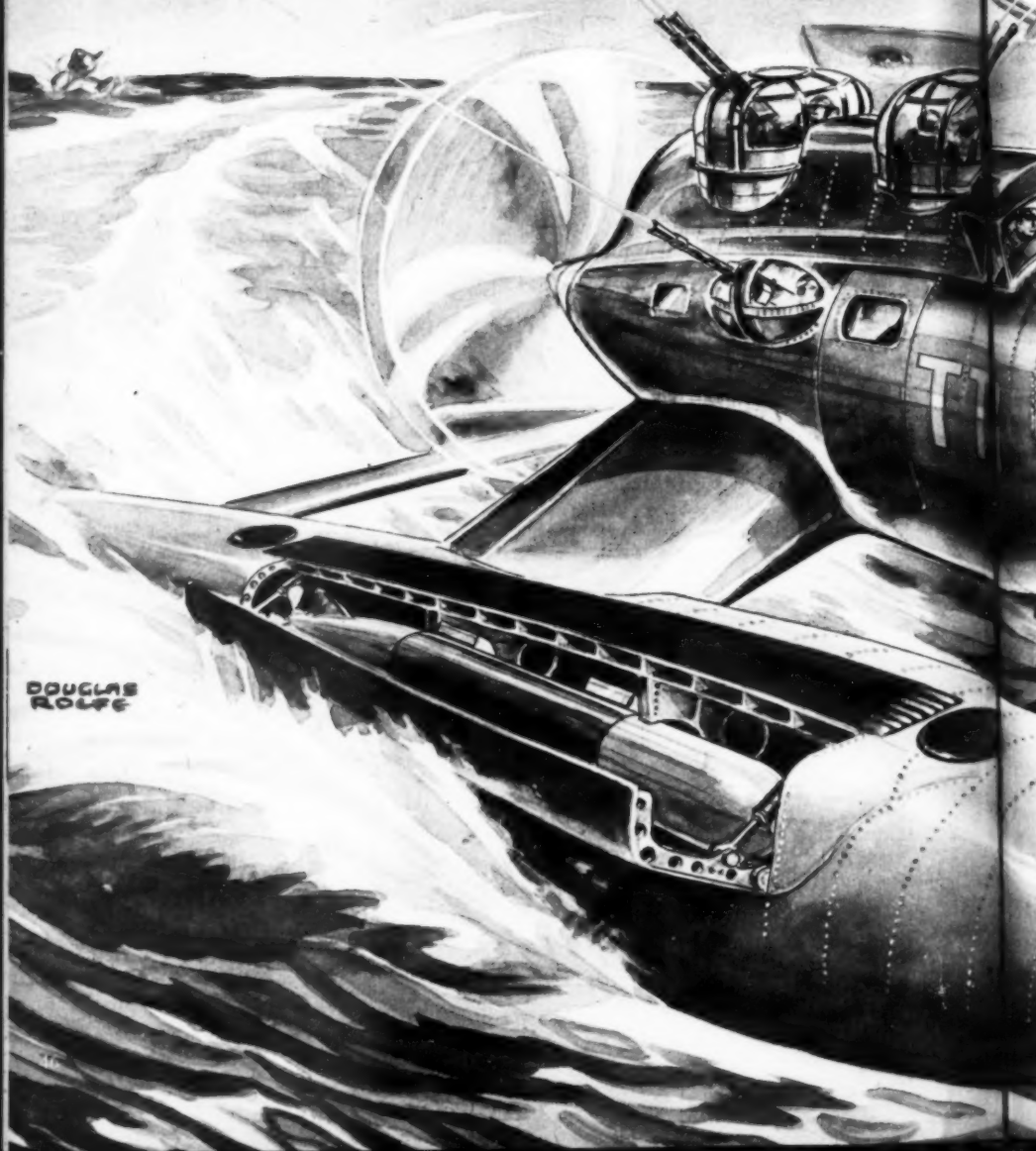
First a member of the Corps makes a visual observation of the area from a plane, then aerial photographs are taken. These are given to the art staff to be corrected for pattern. From these pictures a small scale model is made, and the plans for camouflage are worked out upon this model. Then a construction model larger in size but to exact scale is made and the prepared camouflage plans are tried out for construction detail. After this has been found successful, the small scale model with its protective concealment is photographed. Changes, if necessary, are then made. Only then are the plans for camouflage given to the construction firm. Illustrated below you will see these steps in operation.

This, it must be remembered is the analysis for complete concealment. Today most firms in the U. S. are not concerned with this type of camouflage, for unless the status quo changes, there will be little opportunity for aerial reconnaissance. Hence what is being done in most cases is a "tone-down" job. By darkening those features of the installation that have reflective surfaces, they are made to blend with the surrounding territory.

This is all that is required under present circumstances when what is desired is the confusion of the bombardier who has only about thirty-five seconds in which to select his bombing target and release his load. Without previous aerial observation, tone-down will be sufficient in most cases. But we cannot be content with tone-down alone, for we do not known when the [*Continued on page* 183]

100-M.P.H. STEAM TORPEDO BOAT

An interview with F. M. Bellanca, noted Airplane Designer,
by George Daniels



THE fastest and most destructive torpedo boat in the world has just passed the design testing stage, and is now being readied for mass production. Born in the mind of one of America's world famous airplane designers, F. M. Bellanca, this sensational warcraft is amazing even to men who know the bloody toll our torpedo boats have already taken of the enemy.

But to Designer Bellanca it is more than just a mighty war weapon—it is the victory contribution of a man who, as Chairman of the

Anti-Fascist Alliance, was fighting the fascist dictators 10 years before most of us even knew they existed. He saw the Armageddon coming, and he had his answer ready—a 100-mile-an-hour fleet smasher with a range of 8,000 miles. Built like a monstrous pontoon seaplane—but without wings, it will carry its engine and crew in a center nacelle, and its fuel and torpedoes in the pontoons!

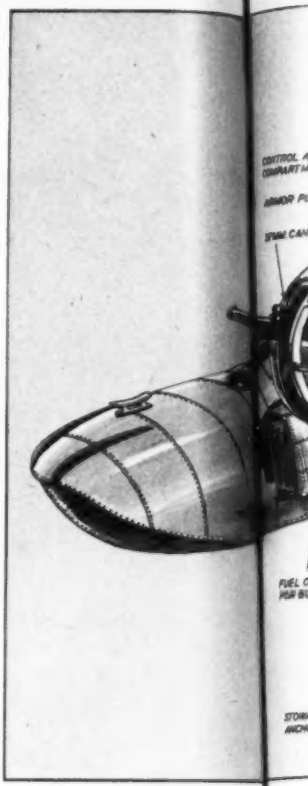
Giant three-bladed contra-rotating airplane propellers at the tail of the center nacelle will drive the boat. Six .50 caliber machine guns and a 2-inch cannon provide the armament in addition to the torpedoes. And should an airplane venture an attack, it would encounter as elusive a foe as any pursuit ship. For this amazing boat will be able to race its engine up to thousands of revolutions per minute to reach more than 100 miles an hour—then within a matter of seconds, stop the engine completely, and reverse it!

"We can leave our Pacific coastal ports in boats of this type, and within 48 hours blast ships in the harbors of Japan," Mr. Bellanca told me, "and attacks on Germany and Italy from our Atlantic bases would be even simpler."

But the tremendous range and speed of the hydroplane torpedo boat are primarily intended to make it a sort of seagoing sniper, to harry and destroy both naval and commercial vessels of the enemy.

It is designed to float in less than three feet of water; to lurk in shoal waters and hidden coves, awaiting an opportunity to strike. And when its victim puts in an appearance this super-speed warrior can hurl itself from a dead standstill to nearly two miles a minute in less time than it takes a battlewagon to weigh anchor. With throttles wide open, the hydroplane-torpedo boat rises to its running water line, and draws only 19 inches of water!

Incredible as it seems to the layman, the powerplant that will perform this marine magic is practically silent in operation. Known as the *Warren Engine* (after its inventor, Woodruff Warren) this amazing powerplant has undergone several years of closely guarded testing aboard a laboratory yacht, but has never before been revealed to the general public.



Driven by steam, this engine is 10 to 30 percent more efficient than a turbine, yet less complex than an ordinary automobile motor. An early model, scarcely larger than a juke box, startled power experts by driving the 100-foot yacht at 10 knots with ease.

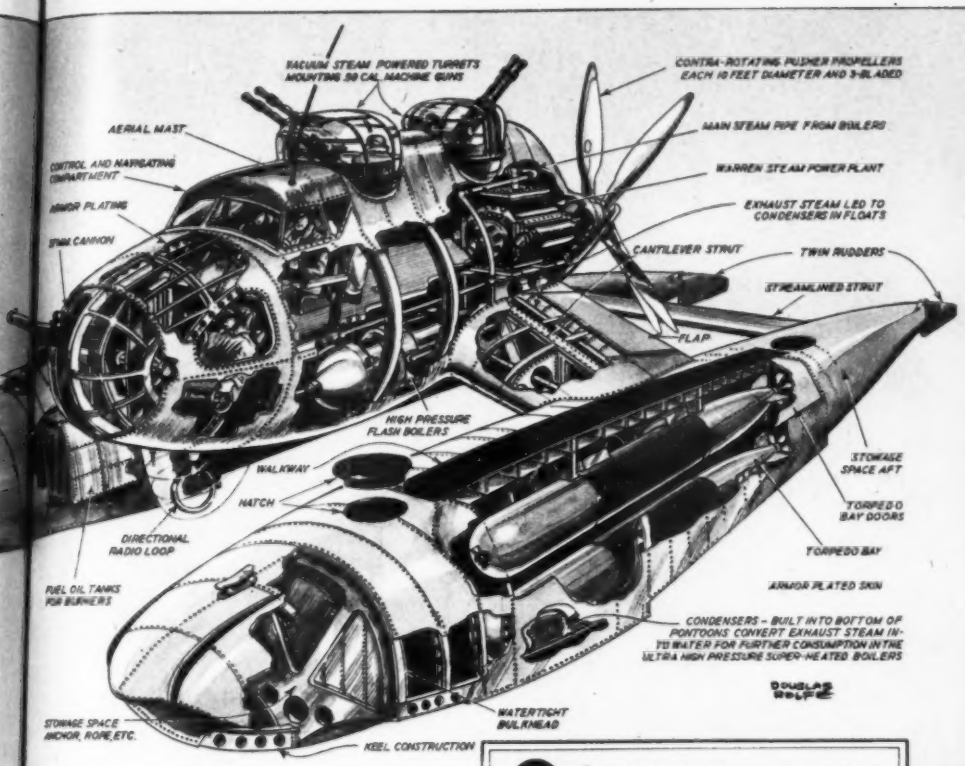
The steam is flashed from a boiler of the type which the Nazis craftily seized from the late Lieutenant Commander Walter Douglas LaMont, famous American naval inventor—to power their battleships of the *Scharnhorst* class. Boilers of this type, though only half the size of conventional units, are far more efficient.

The Japanese, too, were quick to recognize the value of LaMont's invention. They lost no time in applying it to their navy—although they probably feel some loss of face, in admitting that an Annapolis man could invent a better boiler than they could.

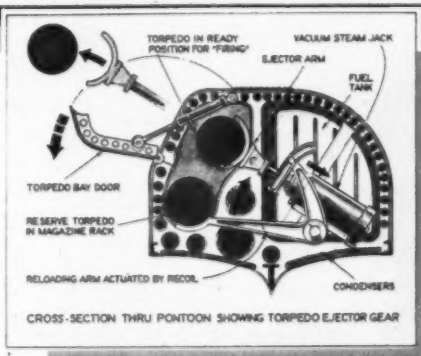
K. Goda, member of Japan's engineering society, Kojakusi, explains it this way:

"In oil tankers of Japan it is very rare to have steam plants. *Kuroshio-Maru* which was recently completed, has three main boilers of such a modern forced-circulating type as never been found formerly in our country (Japan). The steam condition of these boilers is 21 kg/em^{2}G and 350° C. Each boiler generates steam 17,000 kg/h at normal, and 22,000 kg/h at maximum. They are of the Kawasaki La-Mont marine water tube type and each has heating surface of 333 square metres excluding air pre-heater, and is equipped with five oil burners, La-Mont water wall, superheater, economizer and tubular air preheater. These boilers were adopted for the purpose to save space and to improve the whole plant efficiency. One of these boilers was tested on land and obtained the efficiency of 87.29%."

But there's an extraordinary story that goes with the boiler for the new torpedo boat. It will be the lightest one of its power in the world. The first ultra light weight unit of the type was built by an American aircraft manufacturer with the idea of driving a steam airplane! The plans for the new one, however, were specially prepared by combustion


VACUUM STEAM POWERED TURRETS MOUNTING .50 CAL. MACHINE GUNS
CONTRA-ROTATING PUSHER PROPELLERS EACH 10 FEET DIAMETER AND 3-BLADED
AERIAL MAST
MAIN STEAM PIPE FROM BOILERS
CONTROL AND NAVIGATING COMPARTMENT
WARREN STEAM POWER PLANT
ARMOR PLATING
EXHAUST STEAM LED TO CONDENSERS IN FLOATS
37MM CANNON
CANTILEVER STRUT
TWIN RUDDERS
STREAMLINED STRUT
FLAP
HIGH PRESSURE FLASH BOILERS
STOWAGE SPACE AFT
WALKWAY
HATCH
TORPEDO BAY DOORS
DIRECTIONAL RADIO LOOP
TORPEDO BAY
FUEL OIL TANKS FOR BURNERS
ARMOR PLATED SKIN
CONDENSERS – BUILT INTO BOTTOM OF PONTOONS CONVERT EXHAUST STEAM INTO WATER FOR FURTHER CONSUMPTION IN THE ULTRA HIGH PRESSURE SUPER-HEATED BOILERS
DOUGLAS WOLFE
STOWAGE SPACE ANCHOR, ROPE, ETC.
WATERTIGHT BULKHEAD
KEEL CONSTRUCTION

Cut-away drawing of hydroplane torpedo boat. Watertight bulkheads subdivide floats. Float noses carry food on extended trips. They also carry ground tackle.

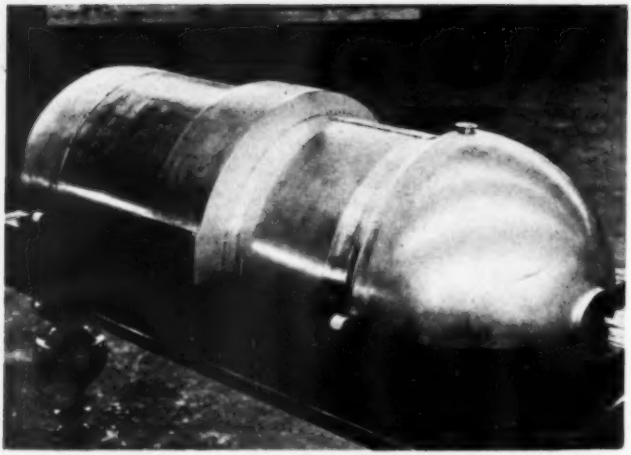


Cross section of pontoon, showing torpedoes and steam torpedo ejector. Condenser tubes in pontoon change exhaust to water for boiler.

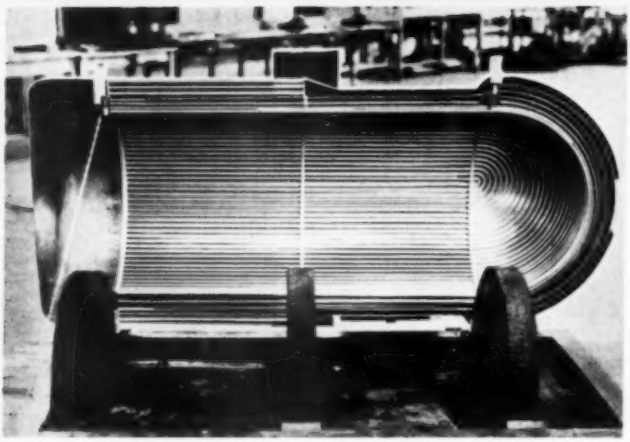
engineer J. T. McTarnahan, friend and co-worker of LaMont. And he had a powerful incentive to turn out a world-beating design. In "Mac" McTarnahan's own words, "If Commander LaMont were alive today he'd want to help win this war—the least we can do is to give his invention a chance to help win it. Somehow I feel that he will know—"

But when Commander LaMont devised his super steam generator he thought of it mainly as a power unit for the United States Navy. Even the inventor himself, never dreamed that one day torpedoes would be hurled by it from the world's most revolutionary naval craft. But today a LaMont boiler is destined not only to provide the 600-1,000 pound steam pressure to drive the propellers of the Bellanca hydroplane torpedo boat, but also to operate the catapult arms that throw the torpedoes clear of the pontoons. Yet no steam will escape from the boat. Every ounce will be condensed into water in the maze of condensing tubes in the bottom of the pontoons, and returned to the boiler.

Deep in the massive floats of the new ocean death dealer, will be the fuel tanks, carefully protected by the toughest armor that science can produce. But even if a stray shell



Outer shell of top half of LaMont airplane type boiler. Centrifugal blower draws air from central ridge.



Interior of airplane type LaMont boiler, showing small diameter water tubes. Water is driven through the tubes by pump while oil burner flames play on them.

A veritable honeycomb of watertight compartments in the pontoons will make it practically impossible for enemy gunners to sink the boat with any gun that can be aimed quickly enough to hit it. In addition to the myriad compartments, the pontoons are designed with self-bailers which automatically remove any water that may accumulate from damage in action.

"The boat will be absolutely unsinkable for all practical purposes," the designer stated, "and it will be extremely difficult to disable it, as we have taken every precaution to protect its vital points and its crew with the most effective armor possible."

Among the additional safety factors of the boat's design, are its twin rudders —one at the tail of each pontoon. No chance hit on one of them will kill the controls.

Ample room is provided for complete radio equipment, which like the armor, may be of far greater size and weight than that used in airplanes, as this high speed baby dreadnaught does not fly. All the usual life saving equipment will also be carried in the crew's quarters, carefully located to be instantly available if needed.

Supplies can be stowed for use during long periods at sea or in hiding. And it need not waste its fuel during its inactivity, for its mighty steam generator can produce a full head of steam in a few moments—less time, in fact, than any other type of boiler ever built.

It cannot be torpedoed, for torpedoes will travel far beneath it. The vaunted magnetic mine is equally useless against the new super-raider, for it can be all plastic—save for its armor. And the enemy's coastal patrols will have little chance to intercept a force of silent

fragment should manage to get through that steely hide, and puncture a tank, there's little chance of fire or explosion—for the fuel is practically the same as that in your home oil burner. And McTarnahan knows what fire and explosion can mean at sea. He's one of the few retired naval men who've been in a battleship gun turret when a big gun exploded. It happened on the old battleship *Iowa*.

As for rough weather, "We can seal her up as tight as a bottle," says Mr. Bellanca, "and no storm can swamp her." He pointed out that the great pontoons are vastly oversized compared to those of an airplane, enabling the hydroplane torpedo boat to ride a heavy sea like a huge water bug.

transoceanic death dealers, racing through the darkness at 100 miles an hour.

The men responsible for the development of this deadly new naval weapon are convinced that engineering skill ranks in importance with military skill in this war. They feel that America's designers have a duty to perform that is as vital as that of our generals, and that no engineer or designer has the right to shirk that duty.

The courage and strategy of our military men must be backed up by the constant efforts of those Americans who design and produce the instruments of war. That fact is apparent to all of us. But the designers of the new torpedo boat and its power plant emphasize that ordinary everyday effort is not enough.

Since the menace of the Axis first cast its shadow on the free peoples of the world, these men have acknowledged no quitting time in their determination to make as great a contribution to America's war machine as is humanly possible. Their theater of war has been the testing basin and the drawing board, and their adversaries stubborn factors of aerodynamics and stress and power. But if their victory over these can help our men in the field and on the seas to smash the Axis to its knees more quickly, they will feel amply rewarded.

Nothing has been overlooked in preparing the new boat. Mass production has been figured into every bulkhead and stringer, along with the elements of physics that have given it its speed and strength. It can be built either of metal or of plastic in vast quantity. And it will impose no added burden on our shipping, for it can reach the scene of action under its own steam, carrying its own supplies and its own ammunition. Its remarkable ability to perform the tasks assigned it, even under the most hazardous conditions, will make it a formidable ally of the craft that make up America's already deadly mosquito fleet.

In short, the new hydroplane torpedo boat will be able to leave its base on either coast of the United States, or perhaps, the bleak, forsaken waters of some uncharted shoal, and race silently to a distant objective.

This 65-mile-an-hour Garber landing boat is another type set for fame with LaMont steam boiler. Details cannot be revealed on performance except speed.

F. M. Bellanca, has been designing and building airplanes since 1910. Among his developments are the twin-engine system with both engines on central line of symmetry with central line of thrust, for stable flight on either engine. Also developed the central beam fuselage type of aircraft construction. His plane designs include both civilian and military ships of single and multi-engined types. He has been the Chairman of the Anti-Fascist Alliance since 1927, and since that date has devoted his efforts mainly to military aircraft.

Many of the aerial and naval weapons now in development by Mr. Bellanca cannot be revealed at this time. All of them evidence the designer's belief that speed in action and speed in production are both of vital importance.

The stern planesman of a sub is much like the pilot of an airplane. He keeps the pigboat on an even keel, working with the throttleman.

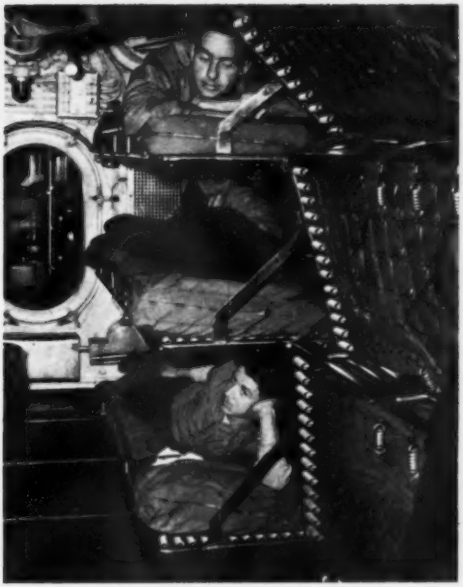
PIGBOAT MEN

Photos by Rudy Arnold

BRAVER, perhaps, than even America's aviators are the men who fight below the waves in our submarines. Often they must spend up to 60 days in the cramped quarters of their "pigboat," most of the time submerged, going for days without a breath of fresh air. Practically all of our submarine action has been in Japanese waters thus far. There, U. S. pigboat men have rolled up an impressive list of victories. One American sub torpedoed and sank a Japanese aircraft carrier in Yokohama harbor on the day after it had been launched! Here are photos of pigboat life, taken during a shakedown cruise. These pictures have been reviewed and passed officially by censors.

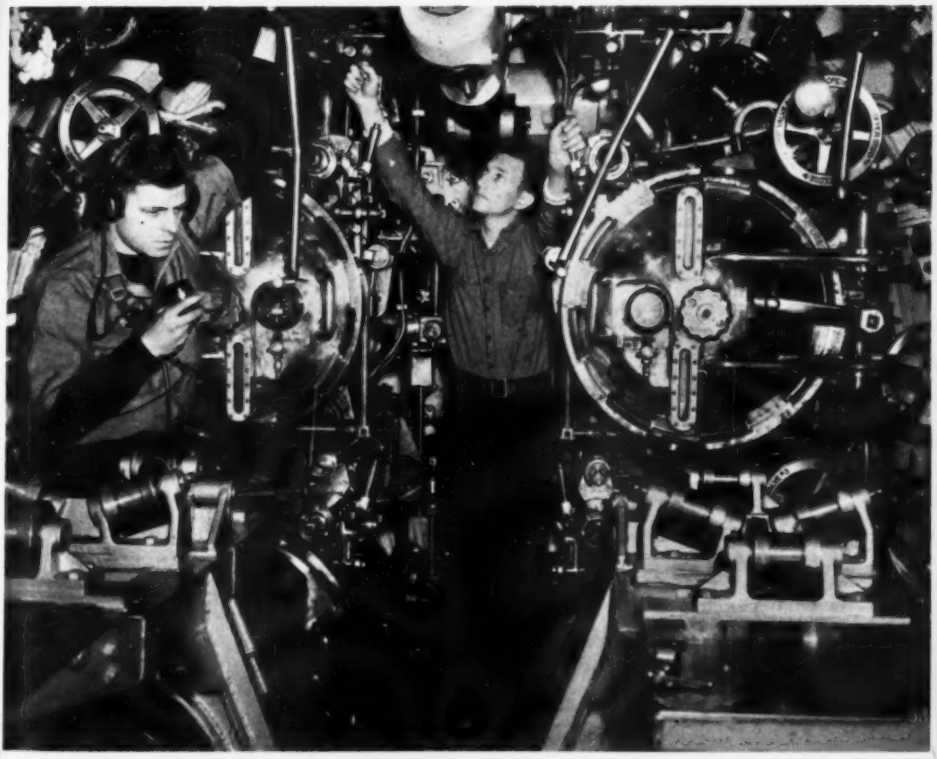
The captain pictured at a new type of periscope, pictures of which have just been released. He calls aim for the torpedoes.

The crew's messroom in a new U. S. sub is crowded, but not so bad as in Axis submarines. But chow is definitely better. Seven men enjoy meal, above.



Berths, three deep, aren't so crowded as mess, and they are marvels of ingenious planning, as a close study of the photograph above will show.

And here's what the sub exists for: torpedoes! This exclusive photo, *below*, shows torpedomen waiting for the order, "Fire!" Note the rollers on which the tin fish are pushed into the tubes.



The Yanks Attack!

The Marines celebrate their 167th Anniversary in November. Here's a salute to them!

Eye-Witness Story!

History was made when the U. S. took its first offensive action in World War II by attacking the Solomon Islands. Here is an eye-witness account of this mile-post of the present war.

by Lieut. H. L. Merillat

United States Marine Corps public relations officer with the troops who wrested the strategic South Sea bases from the Japs eight months after Pearl Harbor—the Yanks' first attack!

GUNS of United States cruisers boomed a salvo of shells into the laps of surprised Japs on Guadalcanal and Tulagi of the Solomon Islands early on August 7's morning. The little yellow men must have thought all the Nipponese equivalent of hell had broken loose. In fact, one laborer later taken prisoner said he thought he was dead.

Salvo after salvo ripped into their midst. Navy planes unloaded high explosives and strafed the ground. Tracer bullets and shells cut the black coasts of the islands redly.

From my transport off Guadalcanal I could hear destroyers pumping high explosives into Tulagi's beach. Then at 08:00, which was "H-hour" (attack hour), the barrage lifted, and the first wave of our Marines landed—and a tiny South Sea Island became the first battlefield in America's first offensive in World War II.

Meanwhile, landing boats were gathering for the assault on Guadalcanal. Proudly flying the Stars and Stripes, the boats took on Marines and equipment and circled in the rendezvous area between the transports and the departure line marked by two destroyers.

The offensive gets under way! Marines with fighting equipment clamber into a landing barge off Guadalcanal isle.

Marine shock-troops pour from the barges in the early phases of the Solomon Islands attack, in several cases in the face of withering fire from Jap machine-guns emplaced on the steep slopes rising from the beach strips.

As our boat sped across the line of departure an amber flare announced that the first wave had landed (without resistance, we later learned).

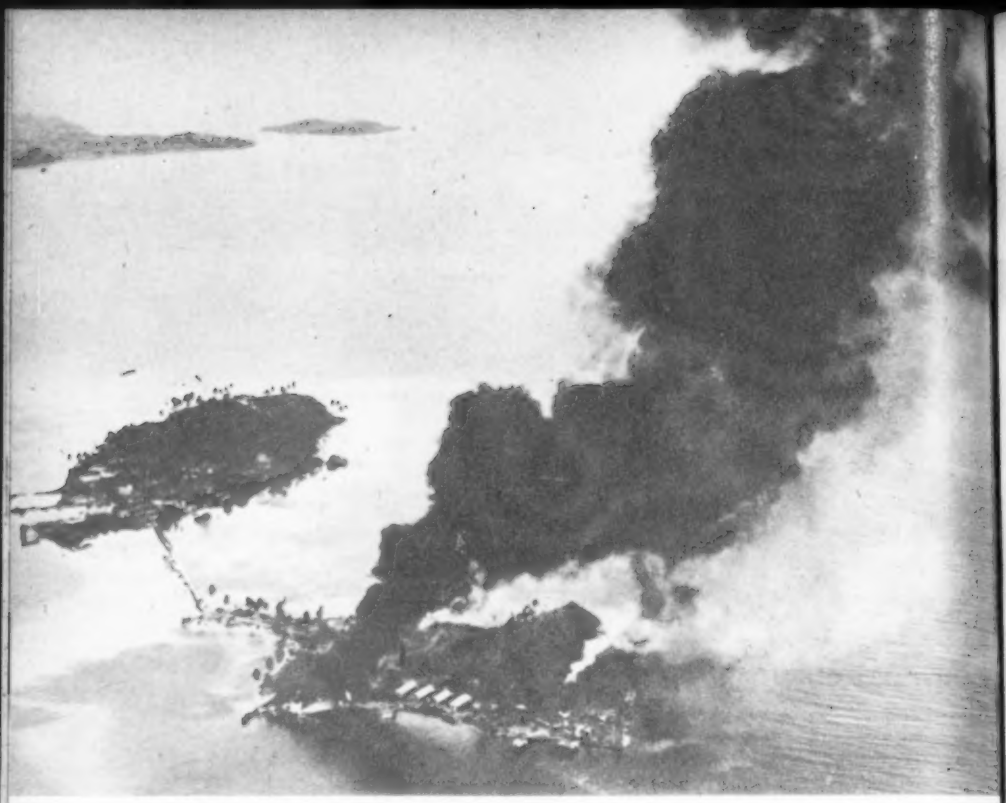
By the time I reached the beach, tank lighters were already busy pulling up with their iron monsters. Amphibian tractors ("alligators" to the Marines) chugged ashore. Marines poured from boats.

It wasn't 'til afternoon that the Japs attacked with bombers hastily organized in Rabaul and flown down. They aimed for our ships, but didn't hit any, and suffered the loss of several of themselves. An hour and a half later they came back, with dive bombers this time. They hit one of our destroyers. Two Japs more were shot down.

Marines began advancing to scattered rifle fire through the tall grass and coconut grove within an hour after the first of them landed. The thick, tall grass and deep feeders of the Ilu river made a cautious advance imperative but there was no contact with the enemy. We later learned they had scurried to the hills. We bivouacked for the night in a palm grove south of the river.

Next day the Marines on Guadalcanal pushed west to take over the big new airfield which the Japs had obligingly built

Mechanized reinforcement followed the assault forces as medium tanks like this one were landed on the tiny tropical islands. One tank driver killed 23 Japs from his turret before being knifed to death. *(Below)* "Rising Sun" sets! Marines hold first enemy flag captured on Guadalcanal.



Pyres of Jap hopes of unchallenged strongholds in the Solomons were fires like this one on Tanambogo Island after American carrier-based aircraft had hit. Jap gun emplacements were blasted. Gavutu Island, *upper left*, was also recovered.

for us, and to occupy and defend the area around Lunga Point. No resistance was met until one group reached Kukum, where they ran into snipers and machine-guns in dugouts. The area was quickly mopped up, but enemy patrols slipped into our lines nightly.

The Japs had left their camps on Lunga hurriedly—meals were still on the tables, personal gear was tossed in all directions. Valuable equipment was left intact. Ammunition dumps, pom-poms, artillery, fuel, radio equipment, trucks, cars, refrigeration equipment, road-rollers, electric power plant—all were just as the Japs had set them up and used them, except for the damage done by naval gunfire and bombing.

The fine airport, almost ready to receive planes, had a runway 1,400 yards long already completed.

On this day the Jap bombers returned, bent on a daring raid. They came in as our transports dispersed out to sea, skimming the waves to lunge among the transports and cargo ships. Watching from the beach, I saw the big bombers burst into flames as they ran into murderous anti-aircraft fire from the ships.

One, two, three—then I lost count in the confusion of the battle. Some ran the gauntlet of ack-ack and headed for the open sea, only to fall prey to our Navy fighter planes darting at them from high above. I heard that 40 bombers started from their base. Few returned.

They hit one of the transports, but their losses were enormous. The Japs' second attempt to disrupt our operation failed miserably.

The second night was a sleepless one for the Americans on both islands. On Tulagi fighting was still continuing. On Guadalcanal the rains came in a drizzle, then in torrents. Bivouacked beneath trees without tents, everyone and his gear were drenched.

Trying to get a cat-nap in our puddles of water, we were aroused by a thunderous bombardment out at sea to the west. Flashes of light told us a naval battle was in progress. That battle is another story, many details of which are not yet known, but we do know

the Jap ships were turned back, ships which had undoubtedly slipped toward the islands to blast us by night, sink our transports and supply ships and bombard the land forces before we were dug in and squared away. But this attempt to knock us out had failed like the previous two.

After that we on Guadalcanal dug in, scouted enemy detachments, spotted snipers, got ready for anything. The Marines had what they wanted and meant to hold it.

Our comrades on Tulagi had a tougher fight. The Japs there, cut off from escape, well dug in and strongly armed, fought from their fortresses to the last man. Hundreds of Marines became heroes and veterans in the bitter fighting.

The first wave of the Marine raider battalion hit the beach in the northwest end of Tulagi. It is hilly and wooded and the Marines expected tough going. The Japs offered no opposition on the beach, however. One man was lost by a sniper's bullet, the rest landed safely.

Avoiding shore trails, which were commanded by steep cliffs, the Americans made their way along both sides of the central ridge of the little island, pushing through dense brush and woods for a mile and a half.

Then the shooting started—a strongly-defended hill held them up an hour. The battle was at short range, with Marines sneaking up on nests of Japs concealed in caves and crawling down the steep cliffs to drop hand grenades into the cliff holes. One company pushed through strong opposition and took the ridge above the playground. The Japs let them pass [*Continued on page* 166]

Less than an hour after landing, the first squads of Marines were advancing among the groves of palm trees and the tall grass of open glades in search of the foe. Taken by surprise, the Nips had fled.

Deserted by its Jap crew, this gun emplacement is inspected by Marines searching out snipers. Paratroopers Kachinsky and Hennessy pictured on page 64 of October MI were killed in the attack.

The nearly-completed runway of the airbase which the Japs had hoped to use against the United Nations—in bombing Port Moresby, for example—was prize of the offensive. It is now our weapon.

These Japanese officers' tents were a shambles after the Americans' heavy attack. Proof that the Nips were caught off-base lay in the discovery of meals still on tables, personal gear abandoned, etc.

THE NEW ERA OF S

Though they lost this Gerlich to the British attackers in Egypt, the Germans are so far the leading possessors of fearful anti-tank guns.

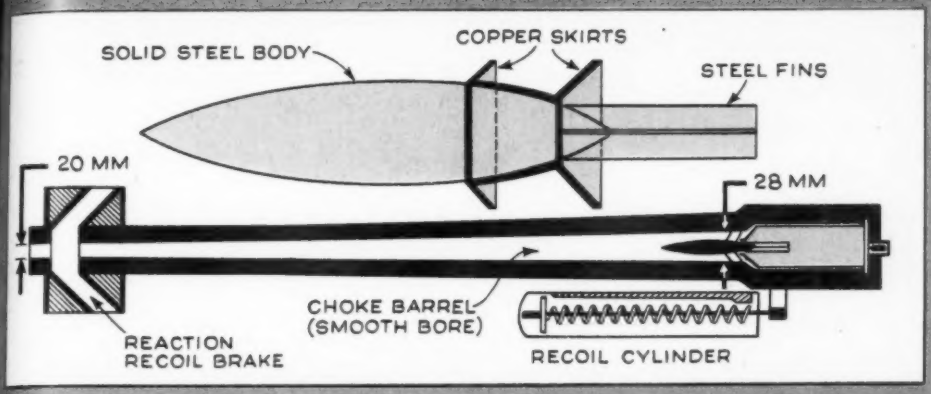
WHEN the armored divisions of the Nazis smashed through Poland and later through Belgium, The Netherlands, and France in *Blitzkrieg* tempo, ignoring major fortifications and overriding minor ones, many observers felt that the World War I era of trench or positional warfare had ended once and for all. Present-day and any future war seemed to be exclusively a war of incredibly fast movement, of quick successive hammer blows on the ground and from the air. That is precisely what the Nazis hoped it would be, knowing that a long positional war would be their certain defeat.

But during these rapid campaigns the Nazis, oddly enough, had among their weapons a new type of gun which is likely to force the armies underground again, to make tanks fairly useless and air attacks very dangerous to the attackers. All these predictions hinge on one *if* only . . . if it is possible to produce guns of the new type quickly in large numbers.

The first of these new weapons, so-to-speak the herald of the coming era of ultra guns, appeared with Rommel's *Afrika Korps* in Lybia. Specimens were captured by British soldiers who nicknamed it the "Squeegee Gun." The official name of the weapon is said to be "28/20 Pak." *Pak* stands for *Panzer*

SUPER GUNS

by Willy Ley



The Nazis' fast, hammer-blow warfare has developed guns of a power that may drive armies into trenches again.

Secrets of the Gerlich are shown in the drawing above: the steel-bodied bullet's copper skirts prevent the escape of gases—all power is concentrated on squeezing the bullet out the smooth-bored barrel, which tapers from 28 mm. to 20 mm. Steel fins keep bullet centered. *(Right)* Russian tank-killers attacking Nazis.

Abwehrkanone (tank defense cannon) and the abbreviation 28/20 refers to the outstanding feature of that gun: the fact that the bore is 28 millimeters (an inch and an eighth) near the firing chamber and only 20 millimeters (four fifths of an inch) at the muzzle. The weapon is also called the Goetsch, Goertsch, Guerlich or Gerlich gun. The last is the correct form, since the name of the inventor is H. Gerlich. The principle upon which the well nigh incredible performance of his weapon is founded is by no means a secret.

Gerlich, who in 1900-1901 worked as an apprentice of the firm of Vickers Sons & Maxim, Ltd. in England, resided in Kiel most of his life and constructed the first

Both anti-aircraft and long-range shelling were performed by this German 88 mm. gun until the British finally put it out of action.

successful model of his new type of ordnance in 1928 or 1929. This model was a shoulder rifle which soon became known as the Halger-Ultra. Gerlich made no secret of his work. He wrote extensively about it and demonstrated it to ordnance experts in many countries. In 1931 he visited this country and demonstrated the Halger-Ultra at Aberdeen proving ground. His work found high acclaim everywhere. Only in Germany was he subjected to attacks, most of them made by a General Rohne who refused to look at the rifle and to try it himself, although he was repeatedly invited to do so.

The reason why the Gerlich type guns may and at some time in the future will drive the armies underground again can be expressed in one term: muzzle velocity. Their projectiles have a muzzle velocity that is roughly twice, and often two and a half times, as high as that of ordinary guns firing projectiles of about equal weight. It is no exaggeration to say that muzzle velocity, other factors being equal, means everything. The muzzle velocity of a weapon determines its range as well as its accuracy and, over a given range, the power of penetration. Since a projectile striking twice as fast strikes four times as hard, the velocity of that projectile is of enormous importance.

The German 28/20 is, as has been said, an anti tank gun, but Gerlich's original model was a shoulder rifle. The Halger-Ultra looked very similar to a normal German infantry Mauser. In fact it was a German infantry rifle fitted with a new type barrel and firing a different type of ammunition. Even the ammunition differed only as far as the bullet was concerned. The cartridge was of normal design and held the customary quantity of ordinary smokeless powder. The inch-long bullet had a caliber of seven millimeters (.28 of an inch) and weighed 139 grains. It was lighter than the ordinary German infantry bullet, which has a diameter of 7.9 millimeters and weighs 197 grains. (The American .30 bullet weighs 173 grains.)

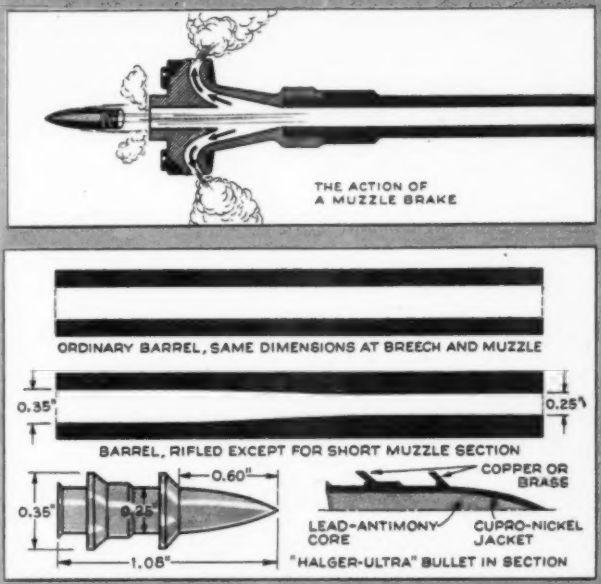
The muzzle velocity of the American .30 is 2,640 feet per second, that of the German rifle is, 2,560 feet per second. The muzzle velocity of the Halger-Ultra was found to be 4,445 feet per second in supervised tests. In other experiments with a slightly heavier propelling charge Gerlich even obtained 5,800 feet per second. These tests were still made with commercial smokeless powders. Gerlich asserted that special powders would result in muzzle velocities of 6,500 and even 7,000 feet per second, a claim that does not seem unjustified.

If the recounting of muzzle velocities does not convey an impression of the awful power of modern bullets, a few figures on feats of penetration achieved with them will do so. The normal American .30 bullet, not even the

Russia, foremost among United Nations in using tanks in large numbers, also has tank-destroying battalions like these Red Army reservists with super guns.

armor-piercing variety, will smash through 69 pine boards each ⅞ of an inch thick and imbed itself in the 70th board. The armor-piercing variety of bullets of the same size will go through anything a man could carry. It penetrates half an inch of armor plate at 100 yards and a quarter inch at 500 yards. Striking heavier armor at that distance, it will flatten out harmlessly without denting the plate but will still penetrate deeply if the obstacle is not armor plate but just ordinary construction steel. The .50 cal. or half-inch armor-piercing bullet will penetrate a full inch of armor plate at 100 yards and half an inch at 1,000 yards.

The Halger-Ultra bullet penetrated $\frac{7}{16}$ of an inch of homogenous armor plate at a distance of several hundred yards. At 70 yards it smashed through several layers of armor plate with a combined thickness of one inch and it punched round plugs out of ¾-inch armor plate. The plugs were later found, deeply imbedded, in a very solid wooden screen which had been placed 24 feet behind the armor plate. But the Halger-Ultra bullets were not really armor-piercing bullets, having a soft lead core with only two per cent antimony and a thin jacket. If they had been of the armor-piercing variety—with a [*Continued on page* 184]



(Top) Cross-section view shows action of a brake permitting gases to escape and thereby take up recoil. *(Above)* Comparison between ordinary barrel and barrel, rifled except for short muzzle section, of an early (1930) Gerlich gun, the Halger-Ultra, and its bullets. Though soft-cored, they smashed through armor.

The junior deputies wear uniforms like regular sheriffs, specialize in juvenile crime prevention.

Junior Sheriffs

JUVENILE crime was cut 95 per cent in a precinct of Los Angeles county, Calif., within two years after its sheriff organized the first squad of junior deputy sheriffs! Fifteen to 21 years old, the unique and unpaid cops now number 200, are on call day and night. They wear blue uniforms like their elders on the sheriff's staff, but carry no weapons, are trained in crime prevention, policing crowds, first-aid, radio communication, fire-fighting. Fees and revenue from an annual show bought equipment: a two-ton red truck, several two-way radio sets, fire-fighting rig, portable first-aid station.

(Below) Auto crash victims receive first-aid from the corps.

Not permitted weapons, the boy cops apprehend pickpockets, etc., with jujitsu. *(Below)* Typical Jr. Deputy is Bill Galloway, 18, who is in charge of the aviation squad.

HELLO BOYS! Here's Fun and Action!

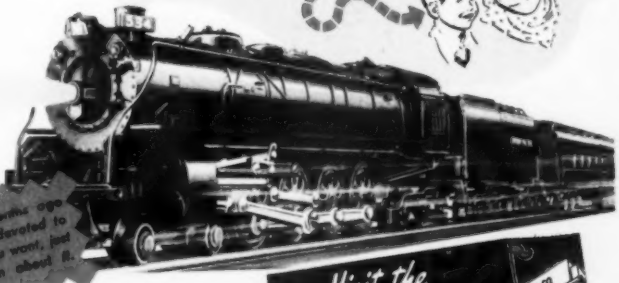
BOYS! Look and listen for the most thrilling and realistic-sounding American Flyer "Hot Shots" that ever pounded down the track.

See 'em in action . . . hear 'em choo-choo! American Flyer's exclusive built-in choo-choo actually reproduces the blood-tingling sound effect of a real train. You can hear those choo-choos 100 feet away. And they are so realistic they change tone and tempo with every change in train speed. The greatest extra fun feature ever added to electric trains.

Here's more exciting news. Every locomotive and car built to 3/16" scale from railroad blueprints. Every locomotive has super power worm drive. *Automatic Coupling and Electric Uncoupling . . . Semaphore and Block Signal Systems*—built to scale—automatically stop and start your train . . . *Remote Control Whistling* direct from train . . . *8 Drive Wheel Locomotives* . . . See and hear the new American Flyer at your local dealers.

GILBERT AMERICAN FLYER TRAINS

HEAR 'EM "CHOO-CHOO"



Toys as we've manufactured many months ago and Gilbert production facilities are now devoted to war materials. If you can't get the set you want, just be a good sport and a good American about it.

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From the Gilbert Hall of Science come American Flyer Trains—Erector—Gilbert Chemistry Sets—Gilbert Polarizing Microscopes—Gilbert Electrical Sets—Erector Brik and other scientific toys.

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It's colossal, boys . . . that towering Erector army training parachute jump. Piece by piece you build it yourself. Click a switch and the powerful Erector electric engine hoists the four parachutes up and up. Then watch them plummet downward—unfold—and float to the ground.

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You can build *hundreds* of spectacular mechanical marvels with *one* Erector set. The Erector electric engine makes them buzz with action! See my new Erectors at your nearest toy store. *A. C. Gilbert, President.*

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1 CHAOS CHAOS @ $2.50

Or a chubby sea urchin for 15c. You can buy them through the unique mail-order business that serves United States biologists

by Elon Jessup

FROGS

	each	per doz.	per 100
Common grass frogs, alive		$2.00	$15.00
Giant southern bullfrog	$1.00	10.00	
Preserved frogs	.25	2.25	
Preserved, and injected with color mass to facilitate dissection	.40	4.00	
GRASSHOPPERS			
Preserved common grasshoppers		.75	5.00
Giant Florida grasshoppers		1.00	7.00
SEA URCHINS			
Live sea urchins	.15	1.25	
Preserved sea urchins	.20	1.50	11.00
STARFISH			
Live starfish	.20	1.50	
Preserved starfish	.50	4.00	
Food for live starfish (small oysters and clams packed in a container) are available at six containers for 75 cents.			
HORSE-SHOE CRABS			
Live horse-shoe crabs	.35 to .65	2.00 to 6.00	
Preserved horse-shoe crabs	.25 to 1.25	1.50 to 9.00	
Vial of horse-shoe crab eggs	.50		
LIVE PROTOZOAN cultures of various types.	.25	1.50	
LIVE SAND WORMS	.75	6.00	
PRESERVED LOBSTERS	5.00		
MARINE AQUARIA SETS	and 10.00		

LIVE PROTOZOAN CULTURES of various types; e. g., the giant Amoeba known as Chaos Chaos: Enough for class of 25 students, $2.50. For 50 students, $3.50. For 100 students, $5.00.

To fill an order, this starfish is being injected with a substance to reveal the water vascular system for study by some scientist.

DO YOU hanker for preserved dogfish today? Or do you need a few live sea urchins? They're a buy at 15 cents each. (Preserved ones are a nickel more.) Of course, if you're looking for bargains, preserved grasshoppers are your dish: only 75 cents for a dozen! Really special is one of the live Protozoan cultures. The giant amoeba known as Chaos Chaos, for example. You can get enough for a group of 25 for $2.50, did you realize it?

If you didn't here's your chance to learn the marketing list of flora and fauna sold biologists by the supply department of the

Florida's yellow grasshoppers are gigantic, consequently fine for study and dissection. Skillful and lethal injections of alcohol preserve their coloring and characteristics.

The fine starfish specimens *below* were picked off a tangle—a mop-like hank of strips which is dragged along the ocean bottom to gather assorted marine life.

Marine Biological Laboratory in Woods Hole, Mass. Demands within reason for almost anything that creeps, crawls, or swims can usually be met. Although specializing in marine forms of life, this service by no means disdains land creatures. It doesn't scorn delivering even *cimex lectularius,* the little oval-backed animal that in other than strictly scientific circles is known as the bed-bug. It prides itself on thoroughness.

A reference catalog of specimens running into the thousands is necessary, in fact, to tell customers of this biological mail-order business what's obtainable. Many specimens are furnished alive, but most are preserved. The only order that was turned down asked for "one whale in good condition." The laboratory's collecting boat *Nereis* can handle almost anything else that makes its home in the sea, however. Among the smaller creatures listed are familiar acquaintances: butterflies, "daddy-long-legs," rattlesnakes, fire-flies and glow-worms, and roaches—including a Florida species measuring up to 2½ inches in length which lab workers have logically dubbed the "housewife's nightmare." The important but unpopular louse is a good seller in all its varieties: plant, fish, cattle, bird, and man's. As the carrier of the dread scourge of typhus, which man has not yet conquered and which may break out dangerously in war areas, the louse is the subject of increased research in laboratories throughout America. Orders from the supply department of the Marine Biological Laboratory naturally reflect such rises and drops in scientific investigation.

Supplementing the tangle is the dredge, made with steel mouth and net so that rocks can be grabbed, brought to the collecting ship. Here the dredge goes overboard for a new haul.

Frogs (whole) are available alive or preserved, as preferred. No biological requirements are overlooked. If you want frog's eggs, be sure to specify which of thirteen individual stages

The dredge brings up a variety. Specimens of bottom-dwelling life are picked out, saved. Rocks go back in.

Unrolling the seine and loading it on a truck of the Marine Biological Laboratory in preparation for a day's collection in one of Cape Cod's inlets. This will be shallow water work.

Hoisting the tangle aboard after it's been dragged along the bottom to snare starfish and other spiney ocean residents.

of development you want them in! Of the frogs of adult status I can speak with feeling.

One day last spring I dropped in upon the Supply Department, to be met by a choir of five hundred croakers in person, all in full voice. Many of them were destined to be studied in nursing-school courses in various city hospitals, college zoology labs, etc. Frogs are in continual demand. During 1940 the service handled more than 20,000 of them!

Runner-up to the frog in demand is the grasshopper—especially the yellow Florida type, largest in the United States. One shipment alone last summer contained 9,000! Those the Laboratory did not need immediately for its summer researchers were stored for future demand. All during the school year, lots of from 100 to 300 hoppers are shipped to schools and colleges for science-class study and dissection. Often the hopper shipments are accompanied by boxes and pails of starfish, dogfish, and sea urchins.

Although the hoppers' pristine beauty remains, their wallop is gone. A shot of alcohol injected in each sees to that. As with other fauna preserved in the Supply Department's laboratory, it takes the touch of an expert technician to make a dead grasshopper look as good as new. An amateur's attempt is likely to result in something that looks like a faded leaf.

As indicated by the Florida grasshopper, the supply department collects specimens from their habitat, wherever it is in continental America, although the bulk of its commodities comes from the Cape Cod region swamps, beaches, shallows, and ocean depths. In the collection of flora and fauna from those

the Marine Biological Laboratory excels. The most important and best-equipped marine station in the world, its Cape Cod location has proved ideal for gathering all sorts of marine specimens. Relatively few biologists and apprentice biologists throughout the country enjoy the privilege of visiting the laboratory in person, but they can all have sent to them the materials with which to work.

It's study of the living that has a special appeal. How inland schools and colleges respond is evidenced in part by the hundreds of five- and ten-gallon aquaria sets assembled at Woods Hole and shipped to fresh-water points. Too, botanists are continually writing for specimens of live sea-weed in various forms. Dried-out sea-weed won't do. It loses too much of its original character after going dry, and subsequent soaking won't restore it. They receive from Woods Hole a pail of salt water containing sea-weed straight from the sea. Starfish, marine worms, mollusks in great variety, crabs, and similar specimens take long journeys inland without ill effect.

For long distance in a live state the prize must be alloted to *limulus*, the horse-shoe crab. Before the war live horse-shoe crabs were daily dispatched to biological centers in various parts of Europe. Supply manager James McInnis and his aides had merely to pack the crab in dampened sawdust and give shipboard instructions to keep the sawdust reasonably damp. *Limulus* rode out the journey, easily, probably thinking he was still idling in one of the tide-pools of Nobska Beach.

Priority in all that's gathered goes to the research workers [*Continued on page* 180]

This fortress-like stone building, a holdover from whaling days when it was a storehouse for whale oil, now is filled with specimens collected for sale.

(Right) A squad of collectors ends a day's expedition to an inlet by putting equipment in order and stowing it on the truck. Tub holds live specimens.

Lab collectors pick over the variegated products of shallow-water seining.

(Left) Seining for small fish and plant life in the shallows of a Cape Cod inlet. Veteran seiners keep the big net close against bottom, trough-like, hauling it in rapidly.

A NEW WORLD IS COMING

by Dr. Charles M. A. Stine,

Vice-president, in charge of research, E. I. du Pont de Nemours & Company

A distinguished scientist here gives an all-over preview of the "World You Never Knew" which is coming when we have won victory.

IN FIGHTING a war, the all-absorbing intent is to win. There is little time to analyze the rush of events or to appraise their consequences beyond the war's end. The united objective is rightly success for our arms.

Yet under the pressures of a great war there may be compressed scientific, economic and social developments that might have taken many decades to achieve under less urgent conditions. Their effects on our lives and all civilization may be more wide-reaching and lasting than any military conquest. They constitute one of the most imperative incentives to victory.

We emerged from the First World War with a wholly new concept of our possibilities.

The new nation—and it was no less—

These two photos will give you a dramatic picture of the revolution in women's clothing started by World War I. *Left*, 1914. *Right*, 1942. What will come after this World War?

that was built on this continent following 1918, largely as a result of the war-broadened vision, would have seemed a fantastic wonderland in 1914 had anybody then had the imagination to predict it.

The automobile came of age; aviation was established as a potent industry; the "wireless" of war days became "radio," and radio approached the miraculous in the marvel of television. Add to these the gigantic expansions realized by the telephone, the motion picture and rayon, all three of which were undeveloped infants in 1914, and you have a combination of influences truly staggering in their effects upon American life.

Meanwhile, the American woman had taken her destiny into her own hands. In 1914, she wore long skirts, cotton stockings, whale-bone stays, and her "place was in the home." Only the future historian can assess the full impact of this new freedom upon the family, the community and the nation. It was undoubtedly speeded to fruition by the First World War.

There were other advances—you are as familiar with them as I am. When we, the American people, on the seventh day of December, 1941, found ourselves again at war on a global scale, we were living on a plane that bore but little resemblance to the pre-war period of a quarter century earlier. Our clothes, our food, our homes were different. The character of our work was changed. Our environment and thinking were those of a new age.

It is unnecessary to detail what has happened in chemistry since 1914. It was a simple, almost a scientifically primitive economy in which we Americans then lived. On all the seven seas, America-bound ships heavy with goods and raw materials testified to our dependency on foreign lands. The homes in which we lived differed little from those of our great-grandfathers; the tailors of the Caesars knew the textiles of which we made our clothes; the finishes of our 1914-model horseless carriages dated to ancient Egypt and the building of the Pyramids. All steel rusted. The best rubber tires were worn out after about 3,000 miles of highly uncertain road service.

On December 7, 1941, we were living in a new world.

Now, we are again at war. With the full strength and vigor of its young manhood, the industry is fighting again for an American victory and an American peace. To this task wholly it has dedicated itself wholly. And we hear questions: Is the fight worthwhile? Will a victorious peace be worth the price that all too evidently we will need to pay for it? After victory—what? [*Continued on page* 156]

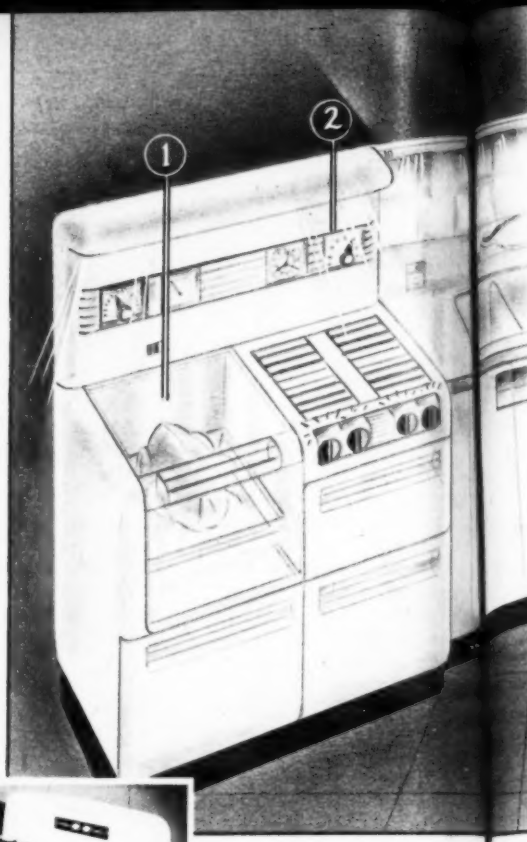
At right: The automobile, as of 1914. *Below:* The automobile as of December 7, 1941. Wartime research will revolutionize it even more!

COMING HOUSEHOLD MACHINERY

by Donald G. Cooley

Designs by Martial & Scull

Third in the MI series "A WORLD YOU NEVER KNEW" picturing the world we are fighting for—the new world coming after final victory



Your "after-the war" kitchen will come in harmonized units, as pictured in the design by Martial & Scull *above*. These units may be arranged in many varied patterns, as shown in the diagram at *far right*. Some of the outstanding features will be: 1. All-glass ovens (already being made by Libbey-Owens-Ford, as seen in photo at *left*); 2. Electronic control devices for range, for "automatic cooking." 3. New "Sterilamp," which sterilizes every-

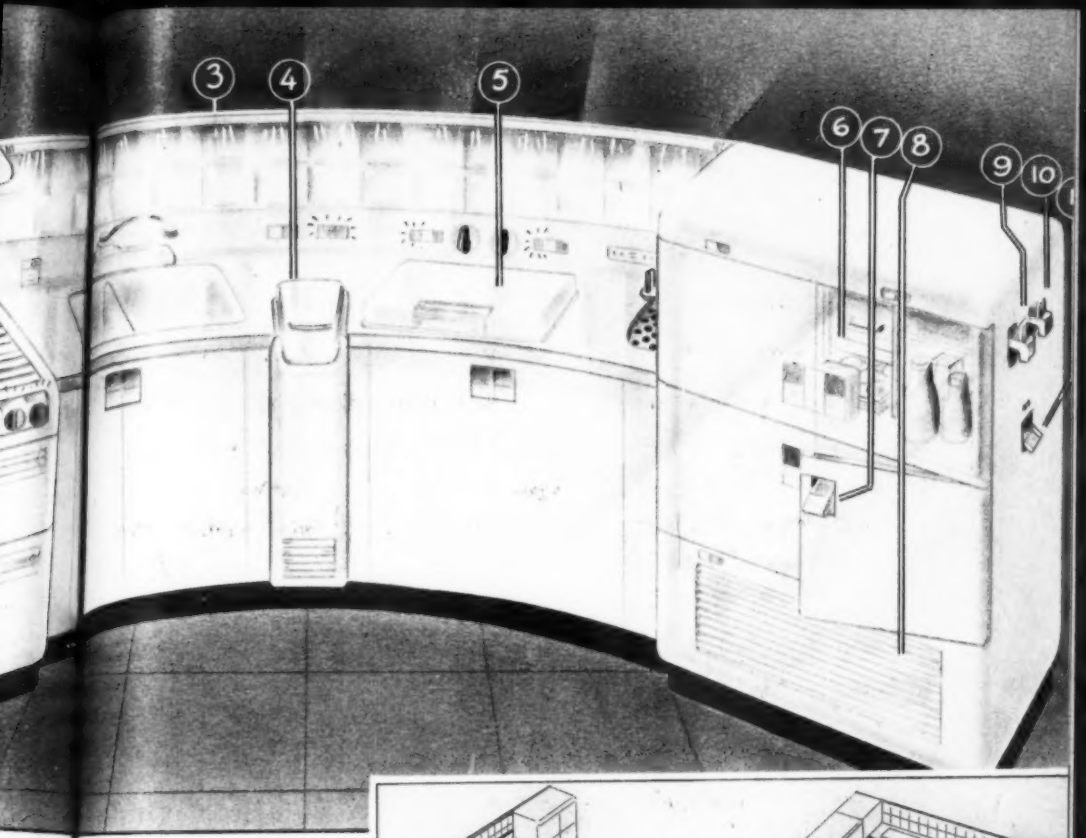
YOU roll out of bed for the day's work but you don't kick off any blankets because there aren't any. You have slept comfortably through a cold night under an invisible and weightless blanket of warmth furnished by lamps that provide heat without light. If you really want a blanket, you choose a feather-weight electric comforter which you plug into a wall socket.

It's a shivery morning, though, so when you switch off the lamp-blanket you dash to the bedroom window and twist a button on a small rectangular box on the sill. Warmth pours through the box louvres into the room —warmth stolen from freezing outside air which contains latent heat that is squeezed out of it by the little window box.

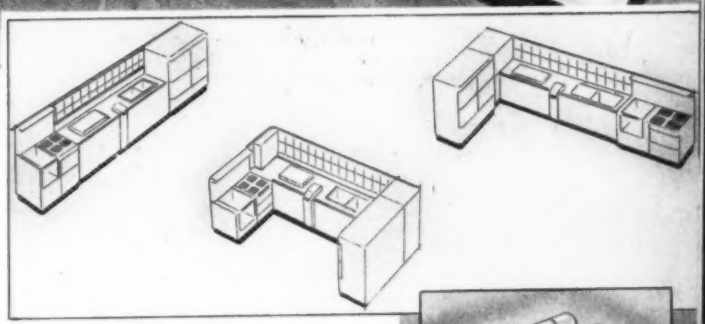
In the bathroom you shower and shave with hot water warmed by waste heat pumped out of your household refrigerator. It is still dark outdoors but you don't bother to turn on the lights as you walk downstairs. The banister and stair treads give forth a greenish glow, captured from yesterday's sunlight, that makes missteps impossible.

In the kitchen you turn on fluorescent lamps and flood the room with packaged sunshine. You hold a cup under a spigot and piping hot coffee pours out, freshly brewed by a gadget that turned itself on automatically about the time you started shaving.

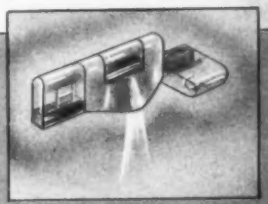
You can step into the living room, lift a condensed morning newspaper out of the radio-facsimile set that printed it while you slept, and read it with your breakfast if your



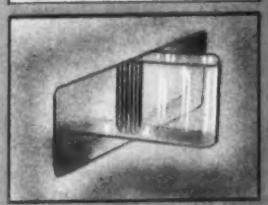
thing on sink. 4. Garbage disposal unit. 5. Automatic dish washer. 6. Polarized plastic doors on refrigerator and all cabinets enabling you to switch on a light and see through door without opening it. 7. Flush door latches throughout. (See detail of operation in cut *below.*) 8. Self-contained air-conditioning unit. 9 Icewater tap from refrigerator. 10. Crushed ice spout. 11. Individual ice cube dispenser.



The units in the kitchen at *top* can be arranged in many ways, as diagram *above* shows.



Detail of new-type flush water faucet in kitchen *above* is shown in sketch, *right.*



Detail of flush door latch *(right)* to eliminate protruding doorknobs, latches, etc.

wife will let you—but that's another story. This month's preview of the post-war world brings you thrilling news about the labor-saving, comfort-giving household machinery that will emerge from the laboratories and designing rooms.

Let's start with the kitchen, where so many good things in the home naturally begin. The door opens itself automatically as you approach it—your first experience with electronic controls that will work for you all through your peacetime house.

It's a luminous, colorful kitchen, brightly lighted by strips and

The "Precipitron," developed by Westinghouse engineers, is an electrical device which instantly clears a home of all dust and soot. Two pictures above show a dust-filled room *(left)* a moment before the device was turned on, and *(right)* an instant later. The dirty white kitten at *left* has just returned from a visit in a home not Precipitron-equipped. Its clean twin has been in a dust-free house.

panels of fluorescent lamps and practically without shadows. The cupboards, sink, and long counter are only remotely suggestive of kitchens you have known. Equipment is installed along one wall, or in an L or U pattern according to the room's architecture. But where is the refrigerator, the range, the refuse can and rack full of drying dish towels?

They're all there, or their substitutes, just where they'll save the housewife the most footsteps. Designers have brought factory methods of straight-line production into the kitchen: from the storage cabinets to the mixing counter to the cookstove to the waste disposal unit and the dishwasher, the business of serving food becomes as orderly as the assembly of an automobile which starts as separate parts at one end of the line and emerges as a complete car at the other end.

Maybe you don't recognize the refrigerator because you're looking for a white porcelain box. This particular refrigerator is a pleasing green, one of hundreds of color tones you might have chosen. All the equipment items, in fact, are this same shade of green, finished in beautiful jewel-tone plastics. The kitchen has been designed as a unit, delivered in a single "package," doing away with the haphazard appearance which often comes from selecting a stove from one dealer, a refrigerator from a different manufacturer, and cabinets from still another maker.

Your refrigerator may be a long, tall cabinet, its French-type doors flush with the wall surfaces. The doors are made of polarizing glass or plastics, opaque until you touch a control which turns on a light within the refrigerator. Then you can inspect the food-packed shelves from without. Apparently there is no way of opening the doors, but you discover that the "handle" is actually a small panel, hinged in the middle, which needs only a slight pressure of finger or elbow on one end or the other—like a teeter-totter—to make the doors spring open. This ingenious control is flush with the surface and appears to be a continuous part of the refrigerator

"Glass wool" being made above will make fabrics you can clean with the wipe of a cloth.

Ketcsseal envisions the day when a housewife can seal fresh vegetables in a bag so they will keep forever.

wall. It eliminates awkward projections, streamlines the design and makes cleaning easy.

Have you ever wrestled with an ice tray trying to extract a cube or two for a cold drink? On your new refrigerator you merely press another recessed control in the side of the box and out tumbles an ice cube, or as many as you wish. Adjust a regulator and instead of cubes you get a stream of crushed ice. From another spigot you get ice water, cooled in a sealed reservoir inside the refrigerator. The supply is constantly renewed from the house water pipes and since it is never exposed to air inside the refrigerator the water does not absorb food odors as it does in an ordinary pitcher or porcelain container.

Your refrigerator need not be square; plastics are easily molded and a cylindrical unit has some advantages: food can be stored on revolving circular trays that bring any article you want right under your fingertips. Whatever its shape, the interior of your refrigerator will be amazingly spacious, thanks to new insulations that cut wall thickness in half. *A refrigerator with outside dimensions of present six-foot models will take care of nine cubic feet of food storage.* And it will be light in

It is expected that wartime research will produce plastic plumbing, as above, which can be twisted in any manner necessary.

weight because of lavish use of magnesium and aluminum, now produced in huge amounts for the war effort.

"We think that major changes will occur in refrigeration, particularly where many metals previously high in price and limited in production will become competitive with materials previously used," says R. C. Cosgrove, general manager of the Crosley Corporation—one of many organizations which has a "Committee of Tomorrow" developing and planning post-war products. "I refer to aluminum, magnesium, and such of the plastics as adapt themselves to household refrigeration."

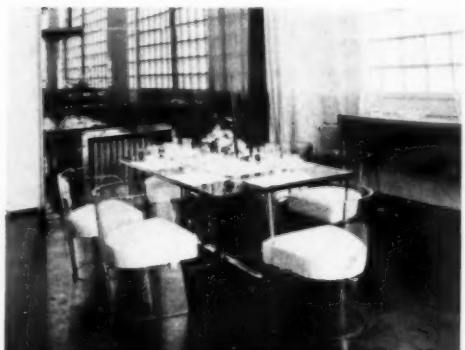
A plastic kitchen, designed as a unit and delivered as a "package," is forecast by extensive researches of the John B. Pierce Foundation, active in post-war housing design. You may prefer colored plastics, transparent ones, or luminous types that appear to glow from within. Cupboard and counter frames may be of light, sag-proof magnesium, fitted with plastic panels rounded to eliminate dust-collecting corners. Enamel-hard surfaces can be kept sparklingly clean by dusting with a damp rag. Cupboard doors can be of polarizing materials that present a pleasing opaque surface until lights are turned on inside to reveal rows of cups and saucers.

Counter tops can be of plastics or unbreakable glass resembling tinted slate or delicately veined marble. Floors will be impervious to steam and water—you can drop knives point-down without injuring anything except the knives. Many common kitchen utensils will be conspicuous by their absence. Can-openers, for instance, will be less essential when foods come in sealed containers of various types of plastic and cellophane, self-opening. Food storage will be greatly simplified when meats are delivered in air-tight coverings enabling them to be stored indefinitely at room temperatures. Just strip off the covering with a rip cord and the meat is ready for the frying pan.

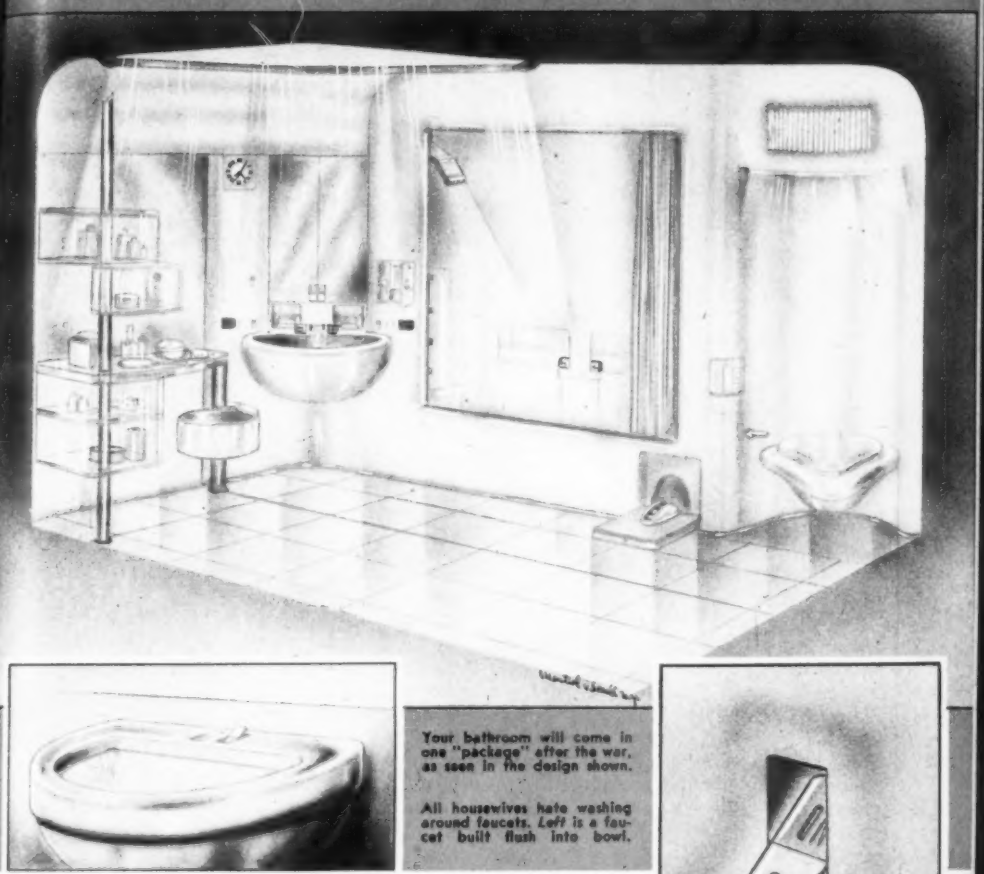
Extra coils in your refrigerator provide cool air for pumping through ducts in the ceiling. The chilled air sinks and bathes the housewife in such a pleasant coolness that the old plaint about laboring all day over a hot stove is permanently blitzkrieged. Moreover, the waste heat which is pumped out of a refrigerator can be put to work by various devices. A refrigerator usually yields enough such heat to provide hot water for the average household. Conversely, kitchen ranges waste a good deal of heat—plenty to operate the average refrigerator—and inventors are

Glass is now being made practically as strong as steel, and unchippable furniture, as *below*, is now being made from it.

The "Glassbed" designed by Pittsburgh Plate Glass Co., above is an example of radical new thought in furniture designing.

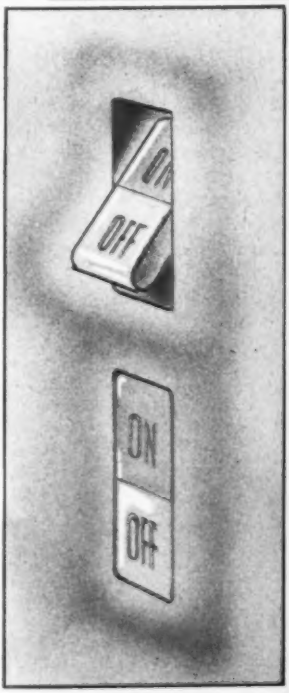


Here is a beautiful dining room set made by Owens-Illinois completely of glass. It supplants metal made scarce by war.



Your bathroom will come in one "package" after the war, as seen in the design shown.

All housewives hate washing around faucets. *Left* is a faucet built flush into bowl.



Electric light switches may be built flush with the wall by same design as in water faucet shown at the *left above*.

working on methods to harness it for that purpose.

Adjacent to the refrigerator, under the counter, is a locker for quick-freezing of foods. This is not a mere storage cabinet for frozen foods, such as many refrigerators now provide, but a low-temperature unit which converts fresh foods into the frozen variety.

Suppose you want to prepare a New Year's dinner that will make guests sit up and take notice. You delve into the locker and lift out several pike you caught last May, or perhaps a side of venison or a brace of pheasants shot during the hunting season several months ago. Another compartment yields corn on the cob, green peas and peaches stored away last summer—all garden-fresh when you serve them as an out-of-season triumph.

Freezing cabinets are nothing new but their wider post-war use will be. Present models cost from $200 up, but moderate capacity units, built into the kitchen package, will be economical to own and operate and will supplement home canning methods of preserving surplus foods.

But your venison and corn on the cob have to be cooked, so you move down the counter to the next unit. Meat

Economical, handsome, comfortable furniture you can pack up and carry to a new home is a present and post-war need being met by Pakto. From a light, flat package you unwrap these three plywood pieces, three screws. The painted piece hooks through one of the lined-oak pieces, third goes on top. Screws fasten it at meeting points and there it is!

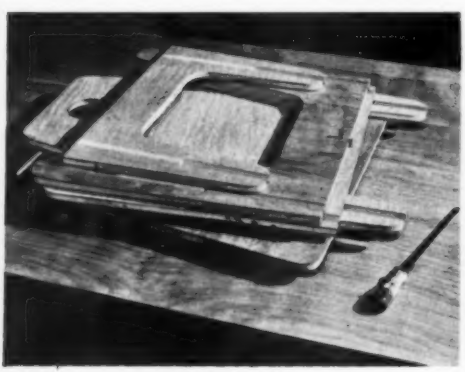
requires longer cooking than vegetables, as each food type goes into its individual compartment. The inner containers are of glass or metal designed to make handsome serving dishes. You transfer them from stove to table and thus save laborious washing of pots and pans.

Automatic controls reduce your labor to a mere matter of dial-setting. The entire meal is cooked without further attention and is kept warm until ready to serve, a laudable feature in case the man of the house is delayed for dinner by converse with a sick friend. The housewife may even, if she wishes, put the foods in the cooker at eight o'clock in the morning, set the timer to pop off at five p. m., and go off for a day's shopping assured of a sizzling hot meal when she comes wearily home at six-thirty.

There will be variety in kitchen ranges as well as other equipment, and one which is already planned for post-war production is the glass range of the Libbey-Owens-Ford Company. The oven of shatter-proof, heat-proof glass permits you to see at all times what is happening to the turkey inside the oven or the cake you don't want to fall.

This new heat-resistant, break-resistant glass is an outstanding example of the type of new products being developed by wartime research which will have endless applications when peace comes. The Libbey-Owens-Ford Company calls it "Tuf-flex." It is a glass which was especially developed for use on the

Just a pile of plywood? Not at all, for with the screwdriver you can put it quickly into form of dining table, chair.



Simple in line and finish, items are scaled to fit new apartments and houses here in the U. S. and overseas.

Though assembled in a few seconds, the butterfly table is sturdy, well balanced. Pakto furniture was invented by Dan Cooper of N. Y. C., is first to be factory-standardized.

Army's 800,000,000 candlepower searchlights and for use on battleships. Due to a special process of tempering, it is so thermal-resistant that you can place a pane of this glass on a piece of ice and then pour molten lead over it, without its breaking. A three-quarter inch pane of Tuf-flex, supported by its two ends, has held the weight of a three-ton elephant without breaking! The glass also has an unusual degree of flexibility.

Already, chairs, dining-room tables, bed frame and all manner of household materials are being built of various types of unusual new glass. Glass chairs made by the Pittsburgh Plate Glass Co. will not break or chip.

Radically new baking methods, not as yet commercially developed, are on the horizon for the home of tomorrow. You can turn out a loaf of bread without a crust by "baking" it electrically. Currents are induced inside the dough which bake the bread from the inside out. Similarly, a potato can be baked with such split-second speed that it appears raw to the eye but is delicious to the palate. Technically, these stunts are perfectly possible today and there is no reason to doubt that some day you will be able to bake a pan of rolls an instant before you want to serve them on the table.

With the meal consumed—fortunately, no one has yet invented a way of eliminating the process of ingestion—the housewife whisks the dishes to the sink and scrapes the leftovers, bones and everything, into the drain. The Disposall unit developed by General Electric grinds up all waste and flushes it down the sewer. Enthusiasts foresee the day when the unsanitary garbage can will be outlawed by legislation.

Rinse the dishes under the faucet, which you can do with two hands if you choose to have the sink equipped with knee-operated valves, and they're ready for dropping into the automatic dishwasher. Set the control valves for soap mixtures and as many changes of hot water as you wish, and in a few minutes your sparkling, bone-dry dishes are ready for use again.

That long, tubular light over the sink is a Sterilamp developed by Westinghouse. It sprays ultra-violet rays like machine-gun bullets, destroying harmful bacteria. You have another inside your refrigerator to prevent food spoilage, and still another in the breadbox to prevent baked goods from becoming moldy.

No doubt you would consider a hike from New York to Philadelphia a most depressing venture, but that is approximately the distance that an [*Continued on page* 160]

This comfortable armchair with back that adjusts packs up *(right)* like a suitcase for carrying. Pad slips off.

What Will Peacetime Transportation Be Like?

What wartime America is finding out about super-cargo-planes, glider trains, helicopters, super highways flung across international borders (artificial and natural) is going to be incorporated in travel for industry and pleasure after the war, you can bet. New luxury, new horizons, new thrills will be available to all—read about it in Donald G. Cooley's next description of "A World You Never Knew," in January MECHANIX ILLUSTRATED. Order your copy now!

You're RIGHT — That's WRONG

Here are 25 statements, some of them true, the others false. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. "Fiddlesticks" are air pressure gauges used by army officers for checking tires.
   True ☐ False ☐

2. In the Army Air Force, the first principle of combat taught student pilots is the "angle of attack."
   True ☐ False ☐

3. Hippophagy has become a common practice among the captive people of Europe.
   True ☐ False ☐

4. The "Flying Buttress" is England's newest high altitude bomber.
   True ☐ False ☐

5. Hitler, Mussolini and Stalin are all taller than Napoleon was.
   True ☐ False ☐

6. Eight months of the year have 30 days.
   True ☐ False ☐

7. Water is a poor conductor of electricity.
   True ☐ False ☐

8. Pernambuco, Brazil, is closer by water to Miami, Florida, than to St. John's, Newfoundland.
   True ☐ False ☐

9. Panchromatic film can be developed in a dark red safelight, while orthochromatic film must be developed in total darkness.
   True ☐ False ☐

10. We are now living in the Cenozoic Age.
    True ☐ False ☐

11. Four 25-watt bulbs give as much light as one 100-watt bulb.
    True ☐ False ☐

12. There is plenty of point to a hystrix.
    True ☐ False ☐

13. If you walked a parasang, you would have covered approximately three miles.
    True ☐ False ☐

14. Five red stripes extend the full length of the U. S. flag.
    True ☐ False ☐

15. Paul Revere lost his horse on his famous ride and had to walk to Concord.
    True ☐ False ☐

16. The first words tapped out on a typewriter were, "What God hath wrought."
    True ☐ False ☐

17. The shark has more bones than most fish.
    True ☐ False ☐

18. "Tri-vision" is an optical fault common among night flying pilots.
    True ☐ False ☐

19. Omar Khayyam was a noted Persian mathematician.
    True ☐ False ☐

20. A rabbit's ears are really radiators.
    True ☐ False ☐

21. Never bring both an apple and a bouquet to the teacher — the apple will poison the flowers.
    True ☐ False ☐

22. When man swallows, he lowers his larynx.
    True ☐ False ☐

23. If you're "cool as a cucumber," you're actually about 20 degrees cooler than the surrounding atmosphere.
    True ☐ False ☐

24. When you see the undersides of the leaves on a tree, you can expect rain soon.
    True ☐ False ☐

25. A Bourdon tube is a tube used to test whiskey.
    True ☐ False ☐

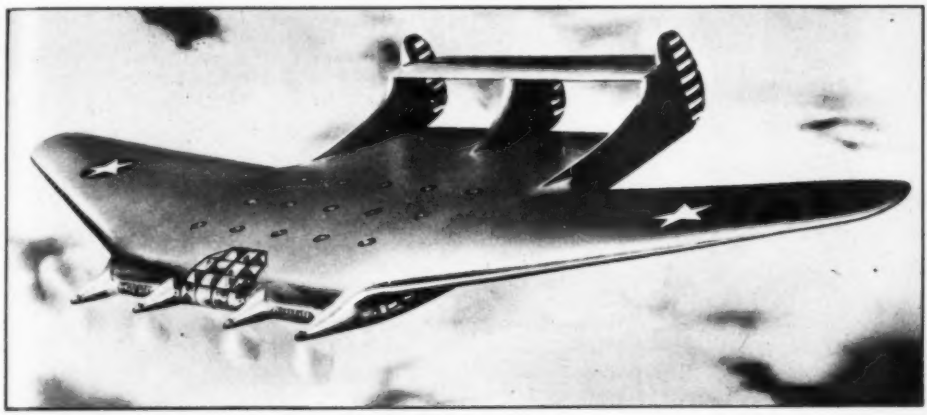
WHAT'S YOUR SCORE?

To get your score simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair and below 60—well, try again next month!

Answers will be found on page 170

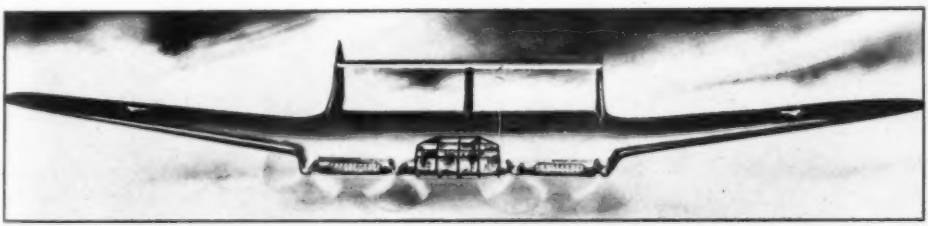
NEWS OF SCIENCE AND MECHANICS

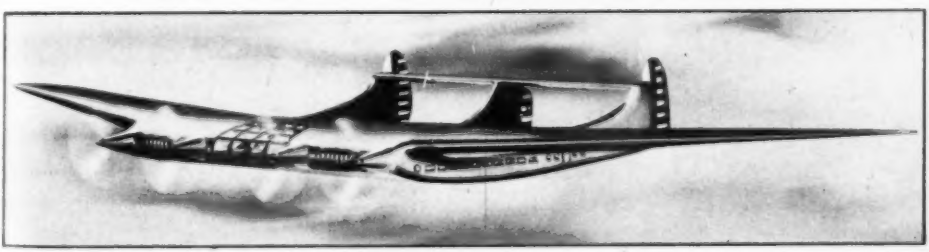
SUPER FLYING - WING TOY GOES TO WORK
GARAGE RAID SHELTER
NAILS REJUVENATED

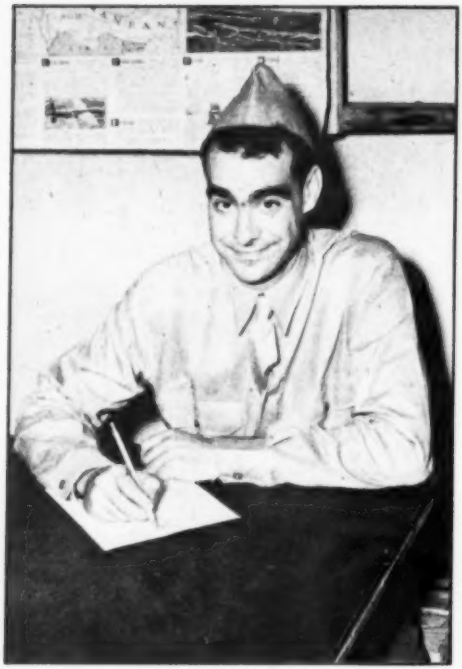


Flying Wing To Carry 25 Tons 6,000 Miles

PUBLISHED here for the first time are drawings of a new super-transport, flying-wing type, designed by Vincent Burnelli. Specifications: wing span, 192 ft.; length, 93 ft.; weight empty, 52 tons; maximum speed, 320 m. p. h., but it will land empty as slowly as a sport plane does; range, 3,500 miles with 35 tons cargo or 300 passengers; four 4,000 h. p. engines. It's automatically stable. Total cargo volume equals eight box-cars!

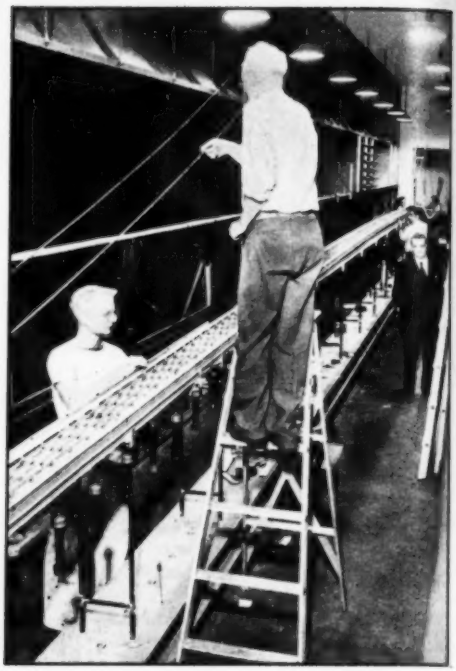






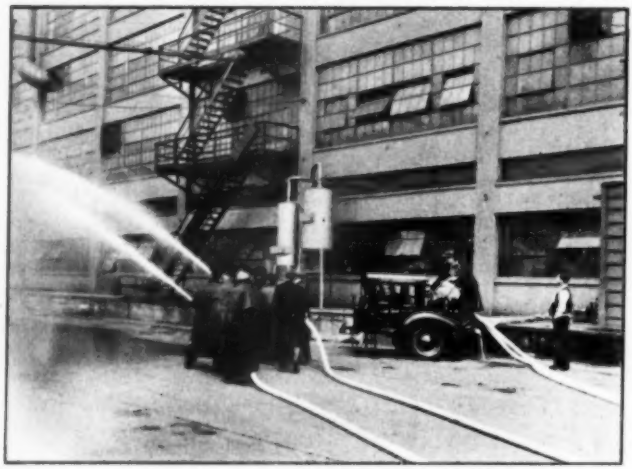
Inventing Sure Pays!

NO WONDER this Camp Rucker, Ala., private smiled—he'd just been paid a cool $350,000 for a patent in the field of agricultural chemistry. He is Pvt. Theodore E. Borst of Clinton, N. Y., a researcher at Wesleyan U., Middletown, Conn., until called into the Army's 54th Chemistry Company.



Non-Shivering Bridge

REMEMBER the Tacoma Narrows Bridge that shivered apart in a gale? Engineers planning its successor have built a model of it (scale: 50 to 1) in a wind tunnel at the University of Washington. It'll go through a simulated bridge-destroying gale; facts found will guide the new, shiver-proof design.



Small Pumper Goes To Fires On A Trailer

THIS fire-pumper so compact it can be put on a trailer as shown, answers wartime needs for inexpensive, lightweight units which can be rushed to the many points where incendiary-bomb fires break out. Large numbers can be kept in strategic locations and hauled into spaces inaccessible by large engines. Trained firemen aren't needed. Capacity is 500 gallons a minute at 120 lbs. pressure.

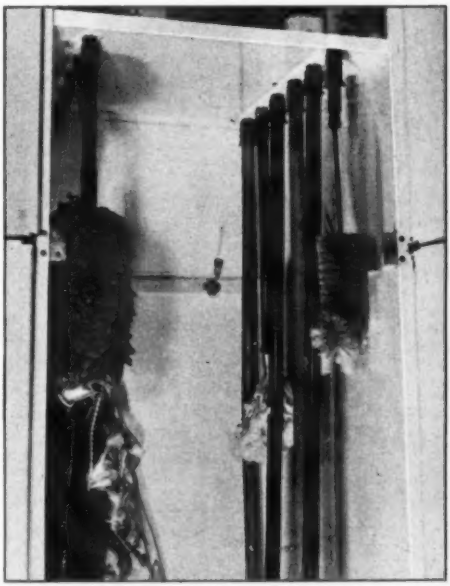
Vivien Kellems amusedly shows her spaniels the little finger toy of which she makes big workaday versions of steel for industrial uses. She's helping an employe demonstrate such use at *right*.

The Toy That Went To Work

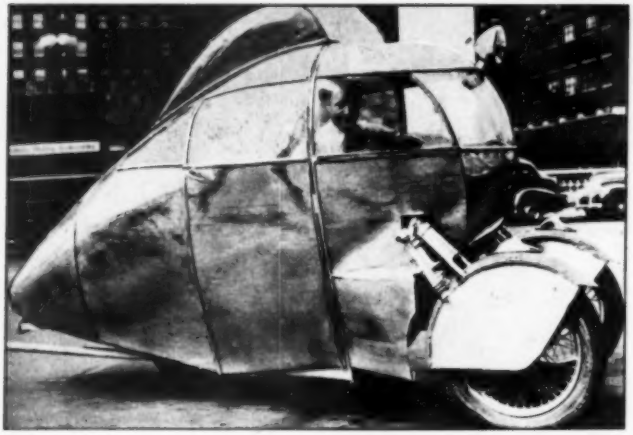
A LITTLE basket-like puzzle which amused King Tutankh-amen centuries ago, and entertains fascinated children today, has grown up and gone to work. It's now performing important jobs on modern American warships and in almost all victory-by-production factories, where as a cable grip it helps pull wires through partitions and speeds lifting and carrying of slippery-smooth, hard-to-handle items!

Perhaps you remember the plaything from your own childhood days—a circular tube of straw into which you poked your fingers? When you tried to pull them out, the tube tightened, holding your fingers fast. The harder you pulled, the tighter the grip of the simple little device. Only by relaxing and pushing it off could the hold on your fingers be loosened.

The principle of this toy is the basis of the cable grip made of steel wire, now considered indispensable on all electrical construction projects. How easily and efficiently variations of the grown-up web operate is indicated in the accompanying photographs showing the ex-plaything at work at home, holding brooms, mops, and other long-handled items, and at a factory holding a heavy, smooth object. Chief manufacturer of the grips is Miss Vivien Kellems of Westport, Conn. Her brother got the idea for the device, and she started making and selling them. Now they're used on cables at Boulder Dam and on the Empire State Building's elevators, etc.



Adapted to home use, cable grips hold brooms, mops, etc.

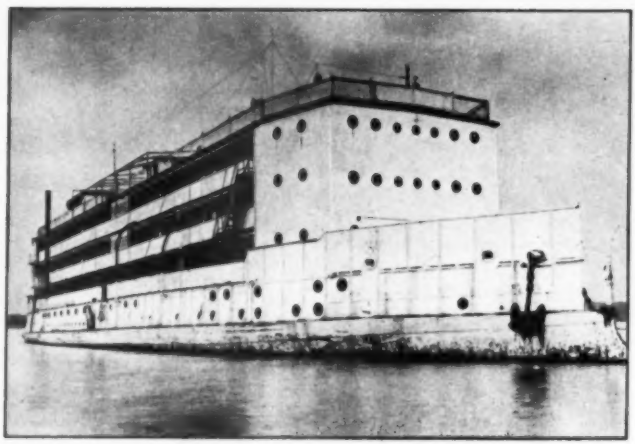


Still Another Role For a Bike: As Bus

BILL LUSK of Cicero, Ill. is shown here seated inside the "cycle Bus" he built from spare parts of other vehicles. The automobile-motorcycle combination gives a hint of what post-war cars will be like with its transparent, curving front and roof. Lusk spent five months building the bus which carries six. He says he can get 50 miles on a gallon of gas. (If he gets gas!)

Ma Washes Clothes, Pa Makes Sub Parts

IN THE cellar of his Green Bay, Wis., home, Joseph Rademacher (left) makes parts for submarines under government contract while Mrs. Rademacher (rear) does the family laundry. Their daughter Jeanne operates a drill while Jim Flaherty, a machinist who helps out when work piles up, is at the lathe. Rademacher, an experienced machinist, started his basement plant after Pearl Harbor to help war effort.



Floating Hotel Helps Un-Crowd Capital

ONCE the U. S. monitor *Amphitrite*, built in 1894, decommissioned in 1924 and converted into a hotel in 1926 for $350,000, this floating boarding-house has recently been towed through the inland waterway from Ft. Lauderdale, Fla., to the Potomac river near Washington, D. C. Its 75 rooms on three decks are helping ease the housing and hotel shortage there. It has all facilities including steam heat.

Garage or Raid Shelter As Occasion Requires

A YEAR ago San Francisco's new Union Square Garage was just a hole with odd expanses of concrete (left). Now it's a 1,700-car garage below a handsomely-landscaped park (above). Four stories deep, the garage can also be used as an air-raid shelter.

Rivets Kept Iced For Plane Building

IN MECHANICAL refrigerators like those found in any kitchen, thousands of rivets are frozen in order to contract them to the smallest diameters. Used to build transports at the Douglas Aircraft plant at Los Angeles, the rivets expand, thus fitting more tightly. (Iced rivets are not used in building bombers. They require a non-protruding rivet to cut wind resistance.)

Hail The Nail-Savers!

UNABLE to get new nails, two ingenious and patriotic movie-lot technicians have devised a nail-sorter and nail-straightener. Jack Gaylord pours a box of many sizes of nails into the hopper for the machine above to sort into the right drawers. Left, Fred Gabourie puts bent, used nails into a specially-geared device which straightens a keg of them an hour by pressure. Use of similar gadgets is expected to spread in industrial plants.

Wood Layers Make Girders Without Steel

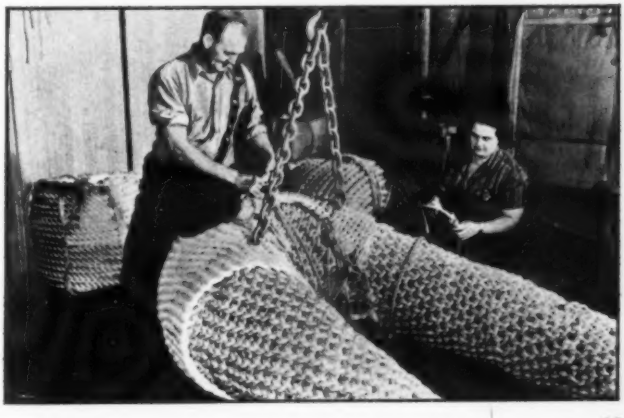
GLUE, already a staunch war worker, is releasing steel formerly required for construction girders. The two beams at left—67-ft. long, 14-in. wide, 40-in. deep and made from 7,800 board feet of fir and spruce plus 270 lbs. of glue—replace girders weighing 20,000 lbs. Besides the steel, $76 a beam was saved! The beams were delivered by logging truck.

All Steamed Up—Again!

THE American Steam Automobile Co. at Newton, Mass., not only makes steam-driven cars but now is converting gasoline autos. Boiler goes on the rear, as above, and engine under the hood (right). Fuel oil is used by present steam-driven types, needing one gallon to travel 9 miles, but by conversion the boilers can operate for a mile on 1½ lbs. of coal. Steam cars run so evenly they are easy on tires.

Making Fenders Is Like Playing Piano

ALETTA and Tom Laursen of Berkeley, Calif., make ship fenders and cargo mats for the Navy, a unique business requiring such finger dexterity that Mr. Laursen says, "It's like playing piano. You got to have it in your fingers." The tug bow-fender they're working on here is made of 6,000 knots of Manila rope, all hand-tied.



Seated Standees

WASHINGTON, D. C., folks, who have the worst transportation problem in the country, now can sit down while they stand in crowded trolleys and buses. On the other hand, seated riders have to stand. The new standsit seats (above) are 10 to 14 inches closer together than customary.

Bulbs' Ponce de Leon

CHARLES R. PIERCE, Seattle, Wash., electrical engineer, demonstrates his Fountain of Youth for burned-out light bulbs. Shooting 2,100 volts through this 1,000-watt bulb, Pierce heats the filament points to 3,080° F. by remote control without disturbing the original vacuum, then welds the break.

Answer to Sabotage: Crime Lab on Wheels

ILLINOIS' answer to possible wartime sabotage is this mobile, 16-ton armored crime-detection laboratory, just placed in service. Besides an armored fortress for riot duty (note gun turret), it is an emergency hospital and photographic laboratory, carries fire-fighting and water-rescue equipment, including a collapsible boat. Operating under the control of the state police, the unit will be able to speed at 60 m.p.h. to any part of the state.

NEWS OF MODERN WARFARE

Kaiser's Cargo Plane

THIS artist's conception depicts the Kaiser-Hughes super-cargo plane for transporting 60 tons of freight 2,000 miles, or 20 tons 6,000 miles, to far-flung battle fronts and to sub-blockaded allies. The twin-hulled seaplane, about twice the size of the biggest airplanes previously built, will be powered by seven 2,000-horsepower engines. Messrs. Kaiser and Hughes are now undertaking the first of 5,000 of the craft in former ship-yards.

Mammy!

IF THEY'VE any sense, Japs and Nazis will drop to their knees and yell "Mammy!" when they see a United States soldier in blackface like this one coming. He means business, and no mistake! The burnt-cork make-up, strictly from Dixie, and green-paint daubed uniform help him sneak up on the enemy. The mean-looking machete and tommy-gun explain why Sgt. Kenneth Elder is called a tank-destroyer.

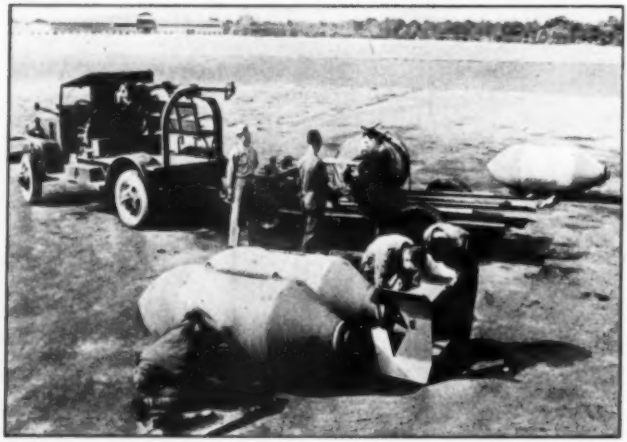
Inflate Your Pants To Save Your Life!

SEAMEN can make a workable pair of life-saving water wings from their duck pants, according to Capt. Clyde Swendsen of Los Angeles, Calif., demonstrating, *left*. Slapping the pants into the water imprisons the air. It slowly leaks out but the pants can be reinflated as necessary. Technique of the idea is now being taught our seamen.

Coal-Scuttle Styles Will Get Ahead

HEADGEAR like this scoopy model on Betty King of Dallas, Tex., is going to be stylishly popular for the duration. It is, of course, a sleek welder's mask which can be tipped back as shown during interruptions.

Miss King, first woman arc welder at the Dallas plant of North American Aviation Inc., set a record by passing the rigid Army welding test after only 13 days' training.

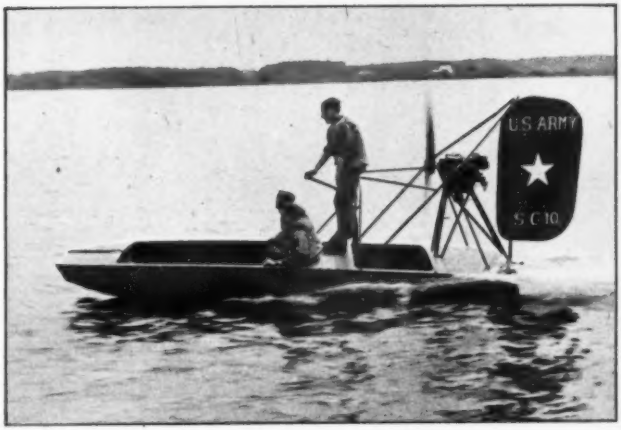


U. S. Two-Tonners Are Biggest Of Bunch

BIGGEST of the bombs being dropped from United Nations' planes on Germany are 4,000-pounders like those at left. United States soldiers are here attaching fins to the bombs before they are taken to waiting airplanes on the low, dolly-like trailer behind the truck in the background. Bombs like these wreak so much havoc the Yanks call them "block busters."

45-M. P. H. Gliders Rescue Planes

TO REACH planes which crash in marshy areas impassable for land vehicles and ordinary boats, the Army uses a swamp glider (*right*). One of a ten-ship fleet at Langley Field, Va., with the sole duty of rescuing flyers, it draws only six inches but is limited to smooth-water use. Its airplane motor drives it 45 m. p. h.



Animated Chart Teaches Workers

IN ORDER to show employees the operation of electrical devices they make and use, General Electric has rigged movie technique to charts. Here's a cross-section view of a magne-blast air circuit breaker which demonstrates its operation to workers at lunchtime by means of lights which go on and off automatically, while a recorded description is heard from the amplifier alongside.

Squat, Tough—So It's Named Churchill!

SO HEAVILY armored they can be used as pillboxes, though their mobility makes them superior to those fortresses, Britain's new, heavy infantry tanks are named Churchills—British equivalents to our smashing big M-4 tanks. Squatty so as to offer minimum target area, the Churchills are toughies, being equipped with six-pound guns, remarkable speed.

Basket For A Bomb

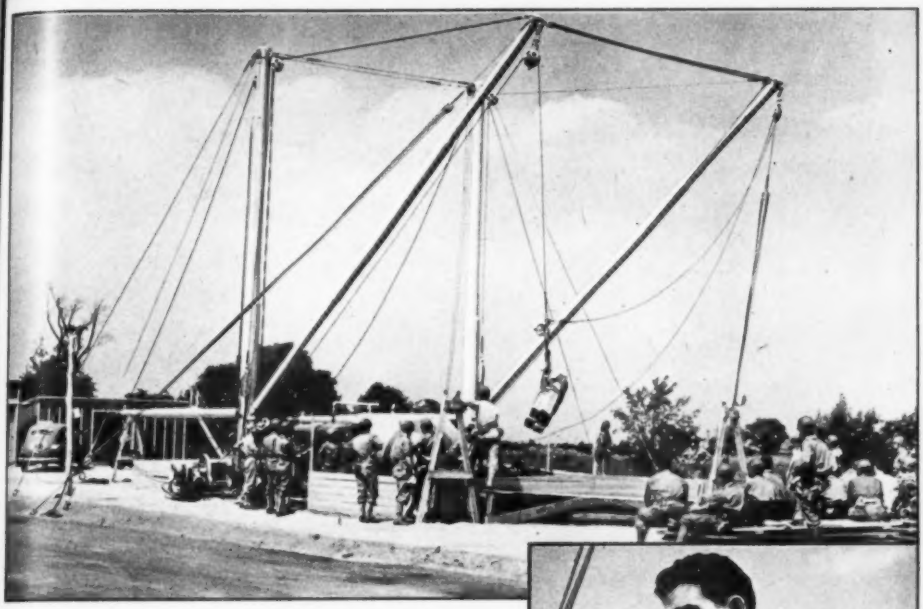
UNEXPLODED bombs can be safely removed from city areas with this basket-like carrier made of ⅝-in. steel cable, demonstrated recently to a war conference of police executives. Weighing nine tons, the carrier would confine the force of the explosion and prevent damage and injury.

Rapid-Firing Cannon

THIS working model of a new rapid-firing gun of cannon power was exhibited in Washington, D. C., this fall by the National Inventors' Council. Holding the model is Miss Jane W. Wolfe of Paducah, Ky. Designed for use aboard ships, the gun would provide more effective protection.

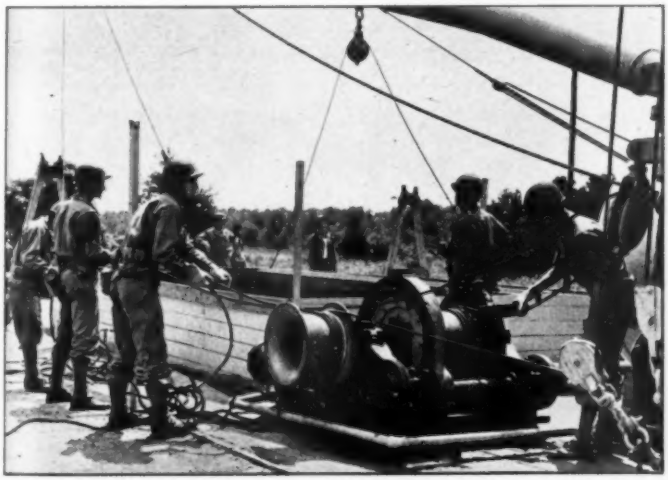
Traitor Radios Are Replaced

THE new marine radio receiving set with which its developer, E. H. Scott of Chicago, is seen, will permit merchant sailors to listen to shore-broadcasts without disclosing their ship's position to enemy subs. Regular radios are banned to seamen because they have an oscillator tube which is actually a low-power transmitter. Radiations can be picked up 200 miles away. The new set cuts radiation to 25 feet!



The S. S. Standstill

A PAINTED ship on a painted ocean is only slightly less real than this hull-less vessel miles from the sea. Officially the *S.S. Dixie*, it's been dubbed the *S.S. Standstill* by the Ft. Dix, N. J., soldiers who with it learn how to load and unload army transports. Forty percent of the men were stevedores before joining the Army, but all of the soldier-seamen soon know the bridle sling (the rope net leading to the cable), the pallette (loading platform), and other terms and routines of handling sea freight. A load is pulled up and away, above, while attentive trainees watch. "Lower away" is ordered by the man in the small photo; his hands inform the winch operator that the right winch is to be raised and the left winch lowered. That means the load is raised from the hold, shifted to the boom over the dock, and lowered. Left, the cargo boom is swung into position as soldiers coil line.

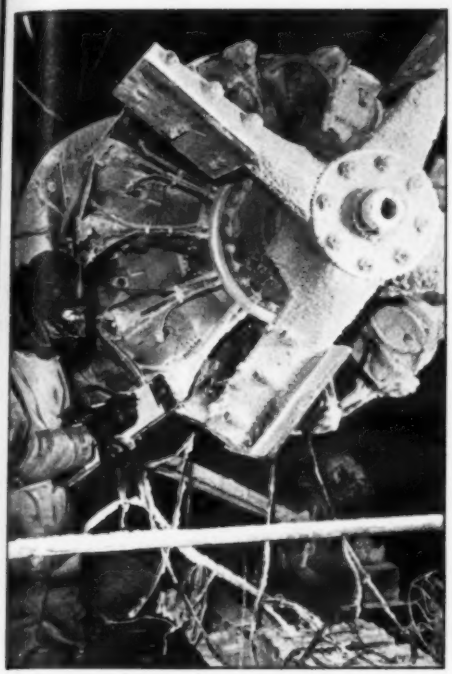


Mobile Shop At Warfront Serves Bespectacled Army

WITH 15 per cent of the armed services bespectacled, this mobile optical shop has been devised for battle-front use overseas. It contains optical machinery, 36,000 lenses, 8,400 frames, and can edge and mount 120 lenses daily—sufficient to serve a field army of 300,000 men. *Above*, first of the new units; *left*, its officer fitting a sergeant.

Test Pilots Get Robot Aide In Air

THE electronic device shown here is a "flight recorder" which obtains data on engine and plane performance in flight-testing fighting craft, which has hitherto been impossible to record. This robot aide represents the first mechanical assistance which it has been possible to give test pilots in their dangerous recording duty.



Refrigerated Fakery

THIS research-worker in a test refrigerator cell in Paterson, N. J., is bundled up to withstand temperatures as low as —60° F., reassured not at all by the fact the cold is faked. The synthetic polar climate is used to make sure our planes will start quickly and operate efficiently on the coldest fronts.

Found: Key to Mines

SNOW offers excellent cover for land mines, as above, so this Red Army engineer uses this electro-magnetic device to locate them. When he hears a buzzing in his earphones, he knows there's metal nearby, probably a mine. One consequence: mines are now being made of plastic instead of metal.

Desert-Color Jeep Is Canada's Version

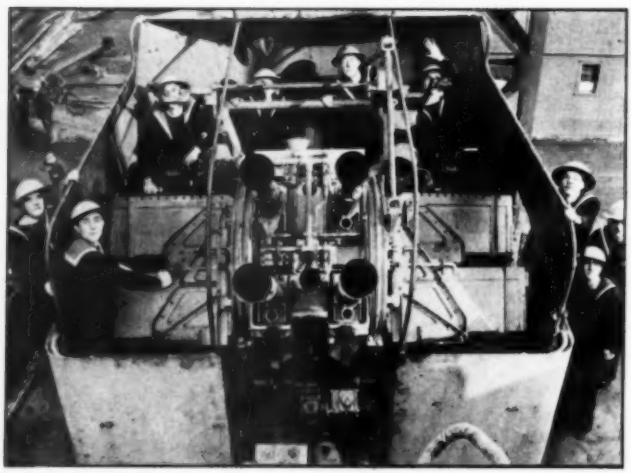
ONE of the Canadian Army's newest vehicles is this 4x4-ft. armored job that's a jeep at heart. Its metal plates are painted a sandy yellow so that it can be used inconspicuously for desert warfare. Details about its production and service are military secrets, but it's known to have excellent speed over broken ground such as that shown in the photograph, taken on the proving ground.

Machine-Shotgun

MACHINE-GUNS are improvised from 12-gauge shotguns for the training of sailors and coast guards at a Lake Michigan base. They can learn to hit moving targets with the machine-shotguns more easily and economically than with regular machine-guns. Fireman (third class) Melvin Markel of Hoisington, Kans., above, demonstrates.

Sticky Pudding

TANK-FIGHTING corps of United Nations forces agree the New Zealanders were cooking with gas when they whipped up the deliciously explosive pudding which the soldier above is viewing with satisfaction. Thrown against the side of an enemy tank, it sticks to the surface and explodes, quite to the taste of the thrower.



Ack-Ack Pom-Poms Adorn British Ship

BRITISH warships like the cruiser at left have effective anti-aircraft armament in wickedly lethal ack-ack guns with a frivolous name: pom-pom guns. They are shown here in the first picture ever released of their business end. All this intricate weapon's external mechanism is nakedly revealed in this unusual full front view.

These British sailors were manning the pom-pom during a practice alert.

CRAFTS AND HOBBIES

PHOTOGRAPHY ● MODELS ● RADIO ● THE HOME WORKSHOP ● HOUSEHOLD AND SHOP KINKS ● FURNITURE PROJECTS ● IDEAS FOR SERVICE MEN ● XMAS ITEMS

Slip-Together Animals . . . See page 104.

LIGHT "PAINTING"

The photographer *above* is using the one-light "painting" technique on a table top set; a typical, detailed result is illustrated *below*. Read the text for how-to-do-it details.

by Frank Caporael

MOST amateur photographers neglect the light "painting" technique which is used in many "tight spots" by professionals. It involves the use of a single "moving" light source on subjects that stay put.

In most cases where light painting is resorted to, it is only necessary to apply the same amount of light to all parts of the subject. This is done by waving the light first on one side of the lens, in an up and down, and circular motion; and then, in the same manner, on the other side of the lens.

There are several advantages to be gained by painting with light, as described. First, it permits of balanced lighting when only one light source is available. Secondly, it permits detail to be put into a subject with many nooks and crannies which tend to show up like so many black blotches with conventional lighting. And still further, when properly maneuvered, the moving light source can add a three-dimensional quality to the result.

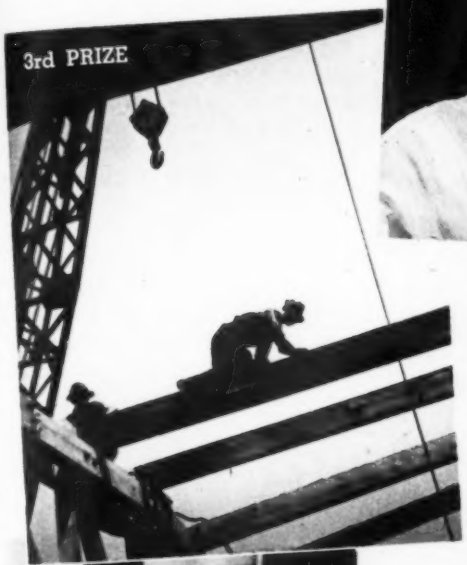
It should be mentioned in passing that the light painting technique can also be used with a two-light setup. In such cases, a main light is used to bring out the modeling of the subject, and the supplementary moving light is directed at the [*Continued on page* 178]

PHOTO CONTEST

FIRST PRIZE ($10.00): "Laugh, and the World Laughs With You" by John Maker, 15041 Hartwell, Detroit, Mich. Taken with a Rolleiflex camera, on Super XX film, developed in DK-20; f/16, 1/100th second. SECOND PRIZE ($5.00): By Robert Metz, 527 Fifth Avenue, New York, N. Y. THIRD PRIZE ($4.00): "Builders of the Future" by Julien H. Turk, 3000 Hanlon Avenue, Baltimore, Md. Taken with a Dollina II camera on Agfa Superpan Supreme film; f/11, 1/250th second; developed in DK-20; medium yellow filter. FOURTH PRIZE ($3.00): "What's Cooking?" by Robert A. Bohlen, 56 So. Middletown Road, Pearl River, N. Y.

Submit prints for this month's contest unmounted—no larger than 8x10 inches. With each print list your camera, film, lens opening and shutter speed, illumination, and developer. Write your full NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. If you want unused prints returned, you must enclose return postage. (Published prints cannot be returned.) Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

1st PRIZE



3rd PRIZE

2nd PRIZE

4th PRIZE

Above: Inclusion of a burning candle has added to the effectiveness of the still-life composition. *Below:* One flood close to the camera brought the light level up so that an instantaneous exposure could be made.

PICTURES BY CA

by Paul Hopkins

WHETHER you prefer to take close-ups of gleaming white candles for diversion during a black-out, or whether it is a wide-eyed action shot of Junior and his birthday cake, there are almost limitless photogenic opportunities in candle-light photography.

Candlelight illumination lends itself to many varied techniques and experimentation with your own original ideas, since candles are useful both as a light source and as subjects. And both uses literally beg for photographic exploration! For example, widely different moods may be easily created by the use of the many available varieties of candles—running from the penny type to those which are elaborately designed—as shown by the manner in which tall candles (plus the appropriate accessories) give an aristocratic mood, or the way in which stubby burned-down candles can create a feeling of

BY CANDLELIGHT

poverty. One of the most photographically fortunate characteristics of the candles themselves is that, while they are pictorial, they are very ordinary household objects made to order for obtaining unusual, mysterious, and dramatic pictures for every camera user. Although portraits may be made by use of candlelight alone, better pictures are made by including the lighted candle in the picture with the subject.

For dramatic effects, the entire picture may be illuminated by just candlelight, as, for example, a person lighting a cigarette from a candle or the interior of a beautiful church completely illuminated by candlelight. For the most part, however, photographs by candlelight supplemented with other types of modern illumination present fewer photographic problems concerned with lighting and exposure.

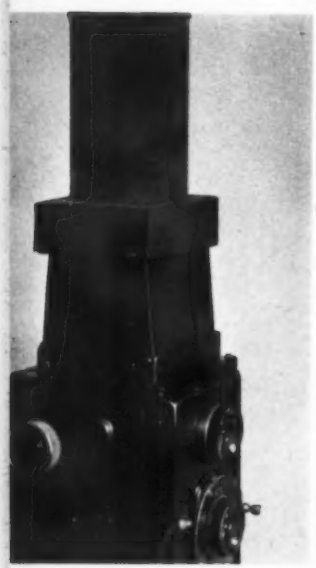
Generally, this latter type of picture-taking may be divided for convenience of discussion into two separate parts, depending on the way in which this additional [*Continued on page* 176]

In the case above, candlelight produced sufficient illumination for the exposure, by itself—in addition to providing dramatic effect.

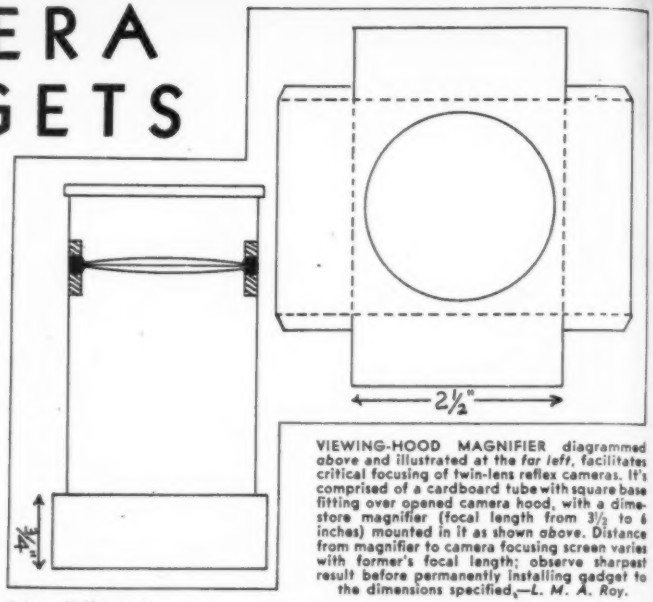
A table-top Christmas card idea along the lines of the suggestion in the text—held to simplest details.

This impressive candle-lit interior required a wide angle lens and the fastest possible film. Exposure of f/18, 6 seconds produced the halos.

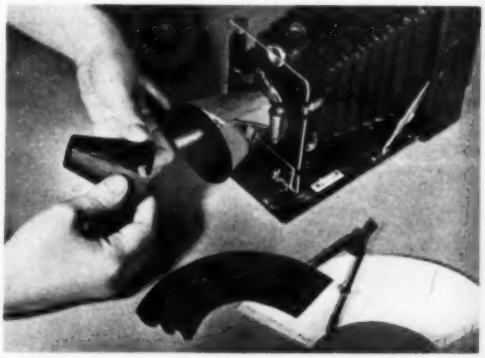
CAMERA GADGETS



Below: Half-second exposures are made with type of shutter shown by setting for "bulb" and also setting self-timer. Pressing release opens shutter for ½ second.—*Kenneth Murray.*



VIEWING-HOOD MAGNIFIER diagrammed *above* and illustrated at the *far left*, facilitates critical focusing of twin-lens reflex cameras. It's comprised of a cardboard tube with square base fitting over opened camera hood, with a dime-store magnifier (focal length from 3½ to 6 inches) mounted in it as shown *above*. Distance from magnifier to camera focusing screen varies with former's focal length; observe sharpest result before permanently installing gadget to the dimensions specified.—*L. M. A. Roy.*



Above: A collapsible lens shade can be made very easily from heavy black paper. First, cut a pattern from ordinary letter paper with flaps and slots for attaching the ends, as illustrated. When the test pattern fits properly, trace it on to black paper or pliable cardboard, later painted black.—*Louis Hochman.*

Left: To avoid accidental double exposures, notch one side of the film holder's black, removable slide. Face notches inward when loading the holder; after exposures, always replace slide with the notches facing outward. If a "used" holder is placed in the camera, the "feel" of the notched slide reveals the error.—*L. H.*

Right: The camera tripod socket can be protected from damage due to over-long tripod screws by slipping a washer between the tripod socket and the stage of the tripod head.—*R. Clay*

SURE-FIRE FLASH SYNCHRONIZER

by Lionel Hartman

. . . for shutters with cocking levers. It works with SM lamps at 1/200th; with foil and wire-filled bulbs at slower speeds.

Fig. 1 *(above)*: Photograph made with the synchronizer described using a No. 0 Superflash lamp with the shutter at 1/50th sec.

THE home-built flash synchronizer described in this article is fool-proof once it has been adjusted. Owing to its construction, its timing is automatic—independent of the photographer's pressure on the camera shutter lever or the speed with which the lever is depressed. Moreover, since the battery current is used solely to fire the flash lamps, battery life is much longer than with electromagnetic or solenoid type synchronizers.

The synchronizer switch consists of two spring-steel electrical contacts held apart by a bakelite spreader. The latter is attached to the shutter cocking lever of the Compur ring-set type shutter (in the case

Fig. 2 *(above)*: A synchronized flash shot with the SM Mazda flash lamp—1/250th second at peak of the flash.

Fig. 3 *(right)*: The home-built synchronizer, as fitted for use to the ring-set type Compur Rapid Shutter.

Fig. 4. Close-up of synchronizer switch; the non-conducting contact spreader is attached to the shutter setting lever.

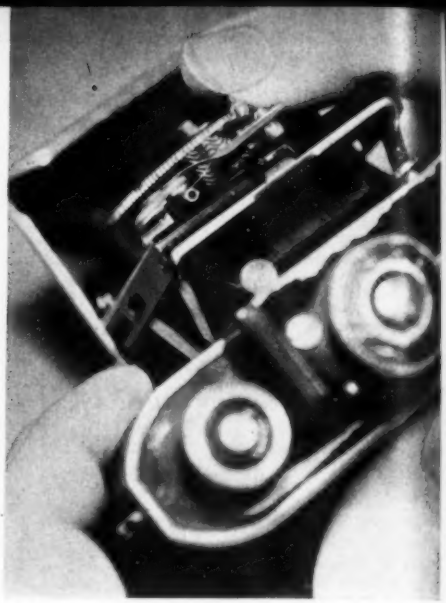


Fig. 5. *Top view of switch showing the bakelite spreader being slipped between the contacts as shutter is cocked.*

illustrated, the Compur Rapid). By slight variations, the principle can be applied to Compur "A" shutters and to all other shutters that must be cocked manually before instantaneous exposures can be made. When the cocked shutter is released, the lever and bakelite spreader spring to the side so that the electrical contacts jump together. This flashes the lamp by completing the battery circuit.

For reasons which will be outlined later on, this outfit can be used with oxygen-filled SM flashbulbs at maximum efficiency even at the higher shutter speeds—1/200th, 1/250th, 1/300th, 1/400th, and 1/500th second. However, when it is used with conventional wire, and foil-filled flashbulbs, both medium base and midget type, the shutter speed must be slowed down to 1/50th or 1/25th second to take advantage of the full light output. The faster speeds *can* be used with metal-filled bulbs, but at such a tremendous loss in efficiency that the SM lamp with its lower

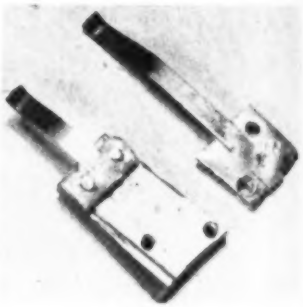
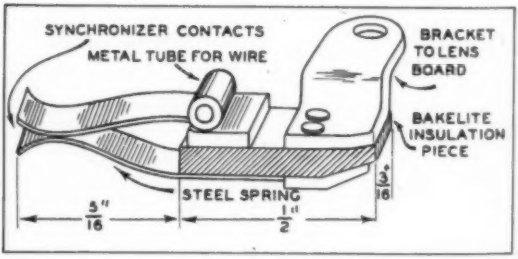
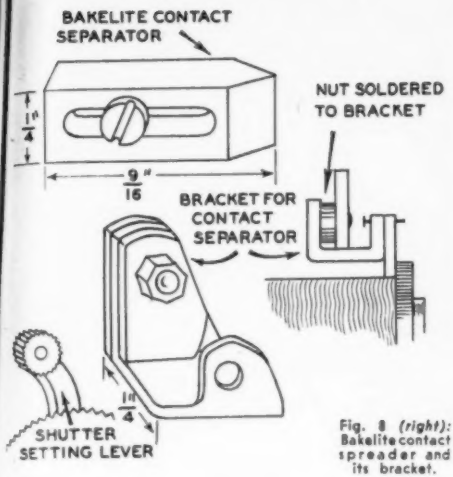


Fig. 6. Spring contacts soldered to their supports; one is shown already riveted to intermediate bakelite piece.

Fig. 7 *(left)*: The completed synchronizer switch assembly. The metal tube takes the wire connection leading to the battery case of the synchronizing unit.





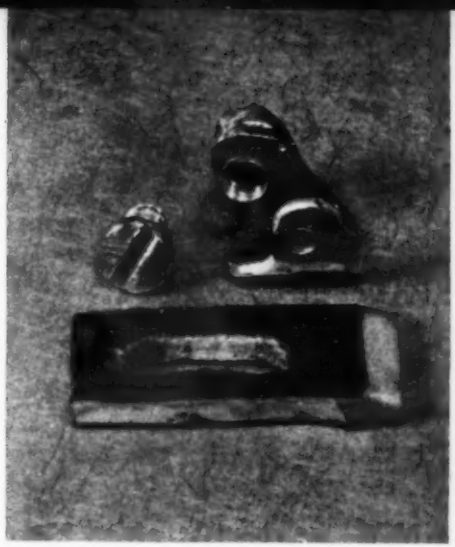


Fig. 8 *(right)*: Bakelite contact spreader and its bracket.

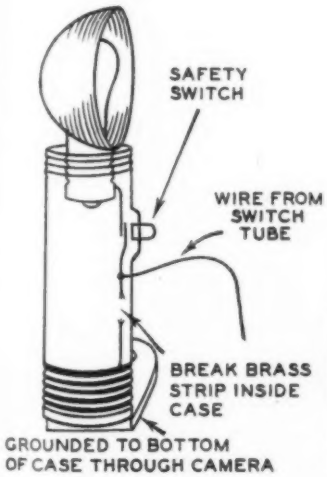
light output will be preferable in almost every instance.

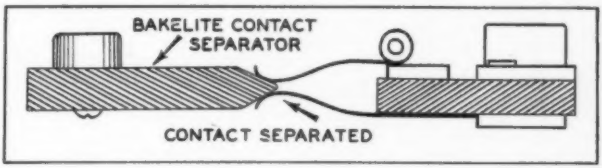
The switch contacts are made from two pieces of narrow watch spring (about $\frac{3}{32}$-inch wide) of unequal length which are bent into curves, as shown in Figure 6. If trouble is encountered in bending them, take the temper out of their tips by holding a match flame to them until they turn blue. Protect the rest of the spring from the flame by holding it firmly in the metal jaws of a pair of pliers.

To make things easier to work with, solder the bases of these spring contacts to small rectangles of sheet brass, as in the same illustration, through which holes are drilled for attaching them to a bakelite insulating support. The bakelite support, which is $\frac{1}{16}$-inch thick, measures about $\frac{1}{2}$x$\frac{3}{16}$-inch. Attach the short spring contact to the end of the bakelite by riveting it in place with small wire brads.

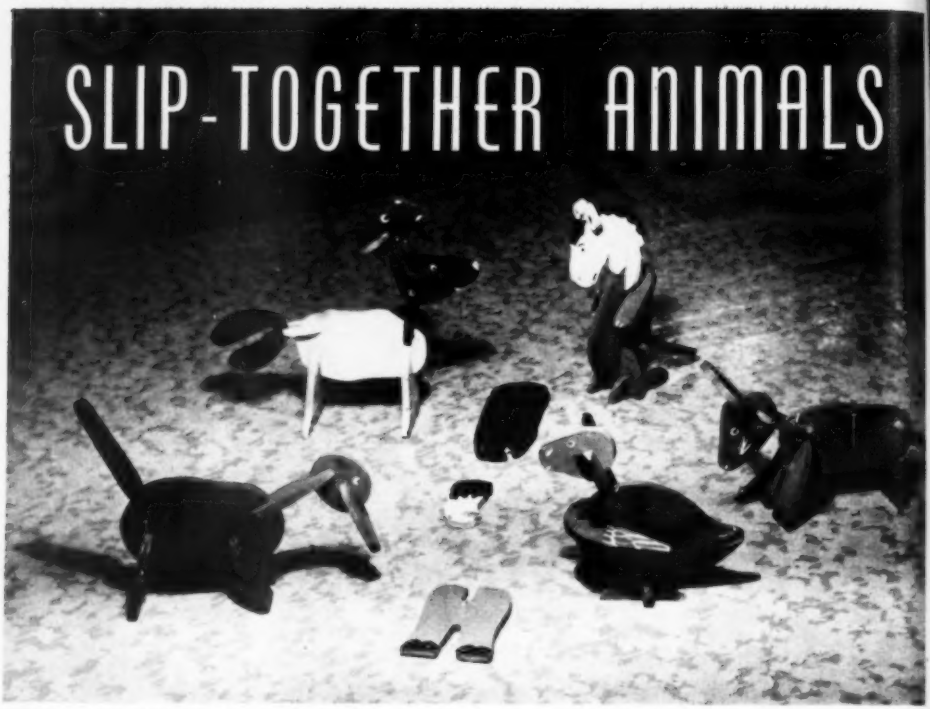
Next make the metal bracket shown in Figure 7, which serves to hold the unit to the camera lens board. This is made from a $\frac{1}{4}$-inch strip of brass, bent as shown and fitted with a $\frac{1}{8}$-inch hole in one end, and two small holes (to coincide with those in the spring contact base) in the other. Fit this to the bakelite support on the side of the short spring contact and fit the long spring contact to the opposite side of the bakelite. Pass two brad rivets through the holes so that, when hammered out, all three, bracket, bakelite, and contact spring, will be held firmly together. The spring contacts should now have their curved tips pressed together in firm contact with each other, and the metal bracket should have plenty of space between it and the short spring contact base so that there will be no chance of an accidental contact between the two. A small metal tube, soldered to the base of the short contact will serve as a socket for attaching the wire from the flash battery case.

This completed unit is attached to the camera lens board opposite the shutter cocking lever, with a small wood screw or if the lens board is a [*Continued on page* 176]



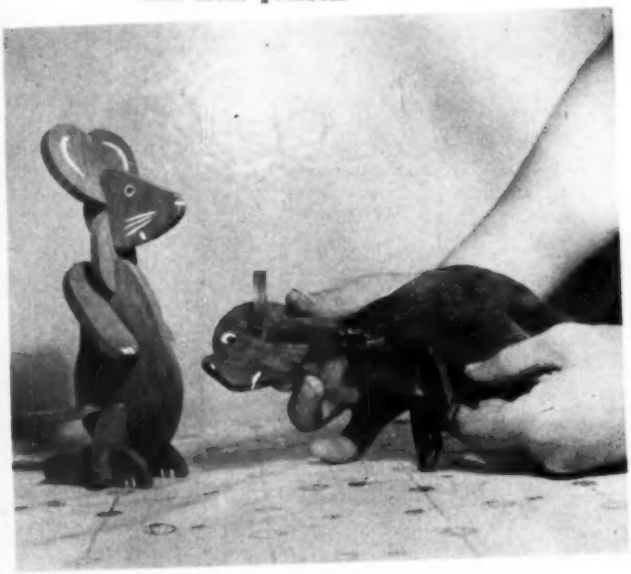


SLIP-TOGETHER ANIMALS



Make a set of these for the kids, then play with them yourself.

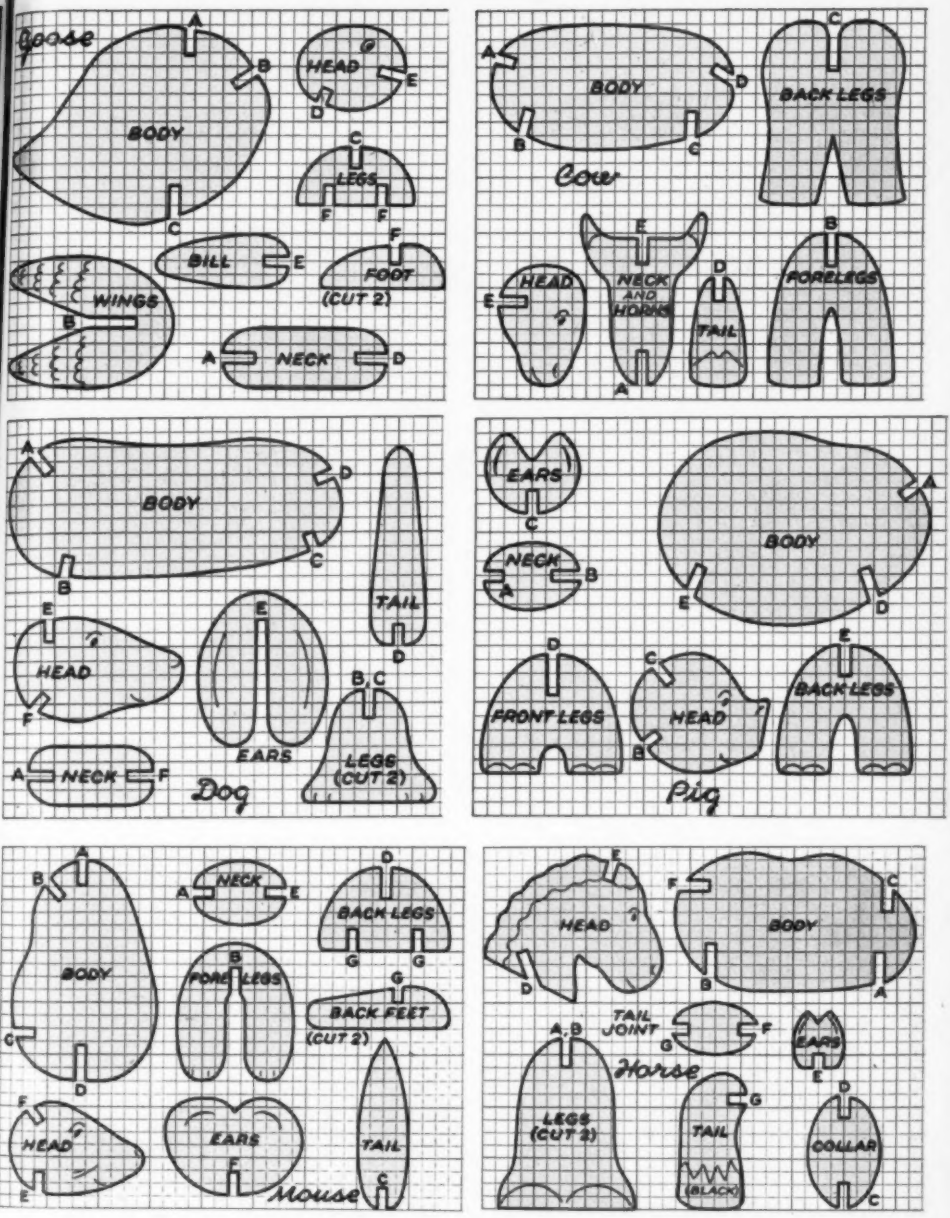
by Elma Waltner



A variety of interesting and humorous animals of your own can be created with the pieces, in addition to the standard types.

THIS group toy will be enjoyed by children of a considerable age range. Quite small tots are able to master the put-together technique, while older children will enjoy seeing how many varieties of plain and fancy animals they can evolve from the various interchangeable parts.

Enlarge the patterns and transfer the parts to ½" plywood. Be sure that the slots are all the same width, to make the parts interchangeable. The slots should be the same width as the thickness of the wood used. A good way to be sure that the slots are all the same size is to make a single pattern of the slot, in cardboard, then use it on all of the slot locations in the various parts of the



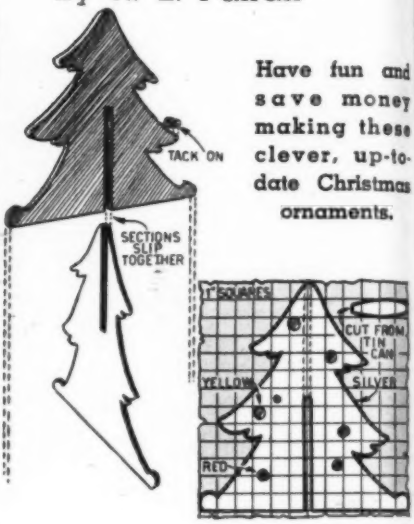
Above are pattern diagrams for the animals. Copy them on paper, transfer to half-inch plywood and saw out with jig saw.

animals. Label the parts of the different animals before sawing out to avoid confusion as to identity of the parts when the painting process begins.

Paint each animal a different color, to make for easier identification of the parts. Character markings are black, on the light colored animals, and white on those that are painted a darker color. Animals in true or imaginary form can be assembled from the parts.

DESIGN FOR CH

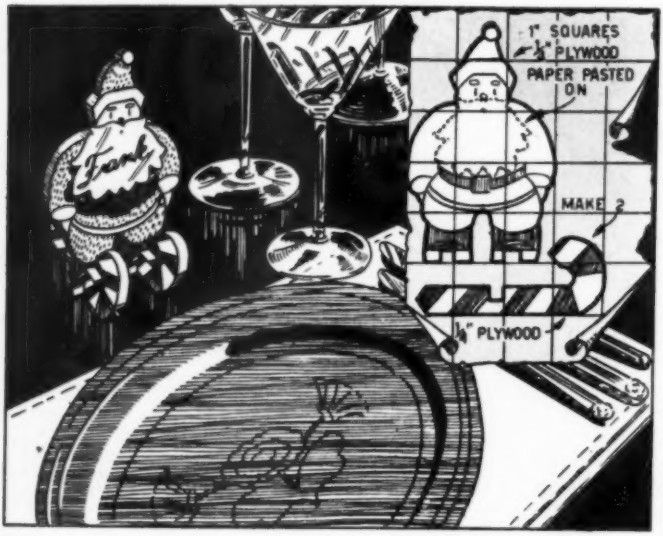
by R. L. Fairall



Have fun and save money making these clever, up-to-date Christmas ornaments.

IT'S FUN to decorate your home for the holidays with these easily made, plywood novelties: place cards, cookie or candy dish, table Christmas tree, and Christmas tree ornaments.

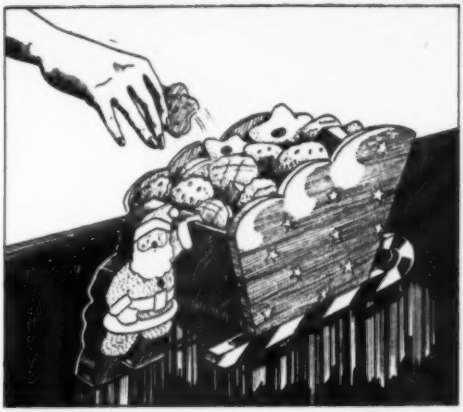
Colorful and timely ornaments are the Santa Claus parachute troops of plywood. Jigsaw the Santas from ½" or ¼" plywood, paint them with enamel; punch holes between the scallops of a 6" paper plate, and tie green thread through each of these holes; then tie half of the threads around each of Santa's arms.



Santa on candy cane skis is an amusing and easily made place card holder. Saw Santa and the two skis from ¼" plywood, slip the notches in his feet over the ones in the skis, and paint in appropriate colors. Cut his whiskers from white paper and paste them to his face. Your guests' names are written on these paper whiskers. The holders may be used a number of times simply by cutting new whiskers.

A colorful plaque to hang in the window or on the front door is made from ¼" and ½" plywood. Trace the candles to ½"

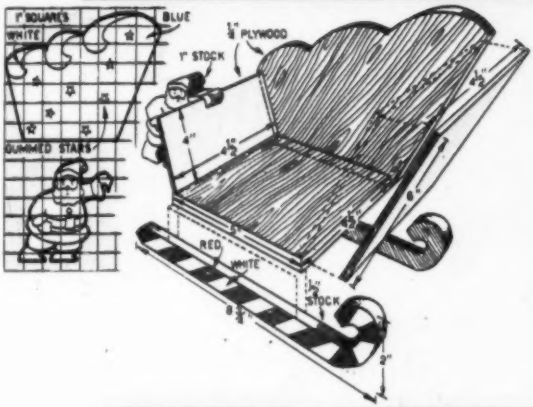
ORCHRISTMAS



plywood and the disk to ¼" plywood as indicated in the squared drawing. Glue the wooden candles to the disk; then glue or tack a thin yellow cloth over the holes in the disk. Light passing through this cloth makes a soft glow around the tops of the candles. Colors are suggested in the illustration.

To make the small Christmas tree, trace the two sections to ¼" plywood, cut a slot 6½"x¼" up from the bottom of one and one 6½"x¼" down from the top of the other. Slip these two pieces together. Cut 1"x3½" sections from a tin can, roll them over a pencil and tack one on the end of each limb and one on the top. These hold small candles.

Now for the candy box. Cut the sides and ends from ¼" plywood, the bottom and runners from ½" stock, and tack together as illustrated. Cut the small figure from 1" stock and glue his hand to the box. Paint the box blue with white trimmings at the top; then stick gummed, silver stars on the sides. Paint the runners and Santa red and white.



REPUBLIC THUNDERBOLT

A takeoff zoom over the camera netted this thrilling flight shot of the model *Thunderbolt*. You can probably get one like this of your own job—using U-controls. *Right:* Builder holds completed model *Thunderbolt*.

by Paul Plecan

PILOTS who have flown the *Thunderbolt* have unanimously praised its excellent maneuverability, high speed, and terrific fire power. One of Uncle Sam's latest fighters, the "Thunderbolt" is sure to become one of the outstanding airplanes produced during this war. With a wingspan of 41 feet and a weight of 13,000 pounds, it is no wonder that a 2,000 horsepower Pratt & Whitney engine is needed to spin the 12 foot four-bladed prop that sends this death-dealing monster into the air. Able to skyrocket up to 40,000 feet, it also clears the 400 m.p.h. mark quite handily, which certainly is bad news for the Axis pilots.

The model presented herewith is a faithful reproduction of the original, and utilizes the popular $\frac{3}{4}''=1'$ scale. With a span of slightly over 30", the model is handy to carry and does not require much material for construction, noteworthy feature in these days of priorities. It is best to use the smaller sized Class A engines for power, so that they may be fully cowled, as was the original "Elf" powered model.

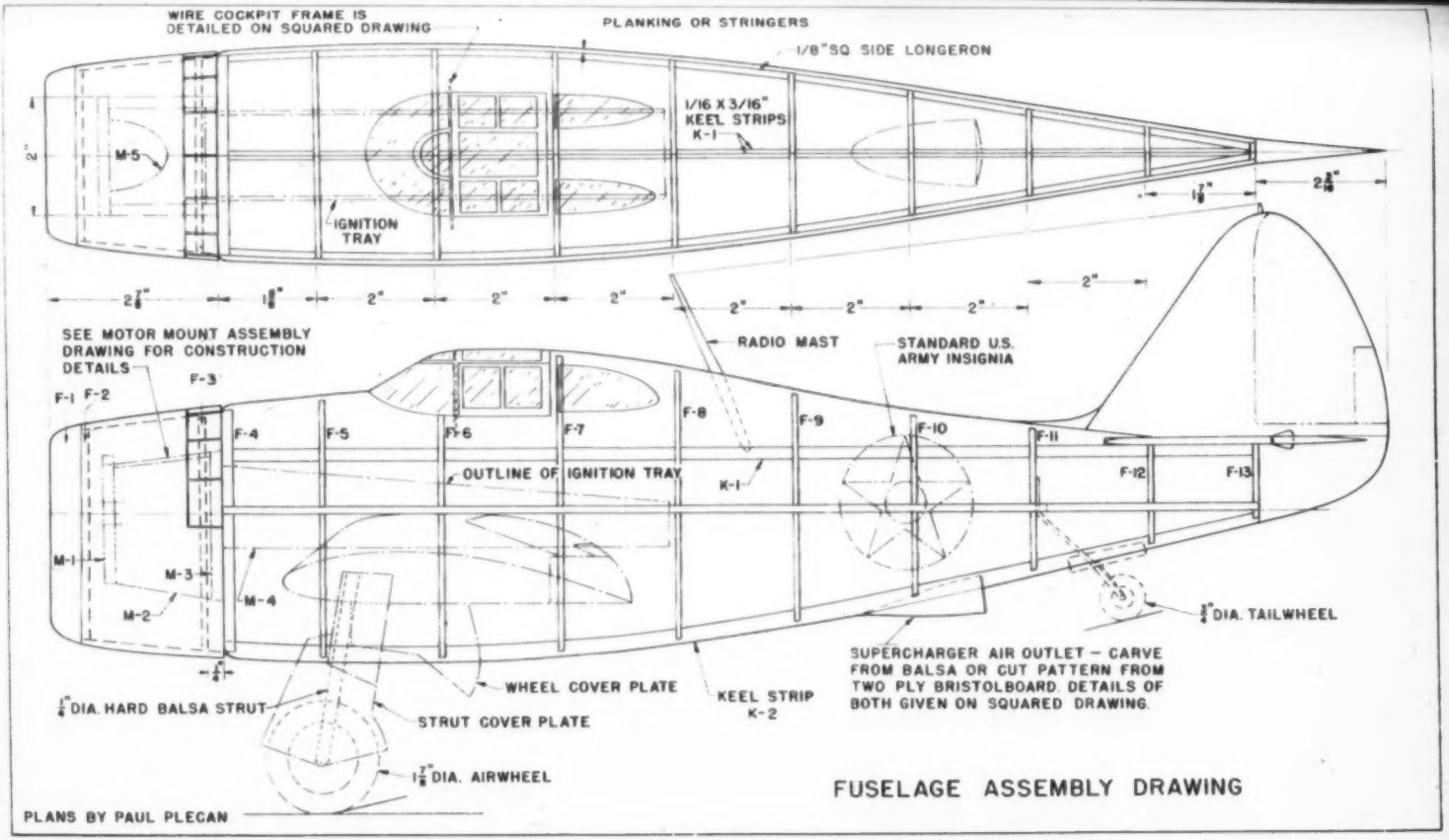
Since the model is flown via the control line method, the weight does not affect the performance greatly, so most any small engine can be used. If any heavy models of the P-47 are built, it would be wise to lengthen the landing gear and to slant it, so that the wheels are further forward, protecting the propeller from damage.

Before starting actual construction, read over the instructions and examine the plans to familiarize yourself with all details.

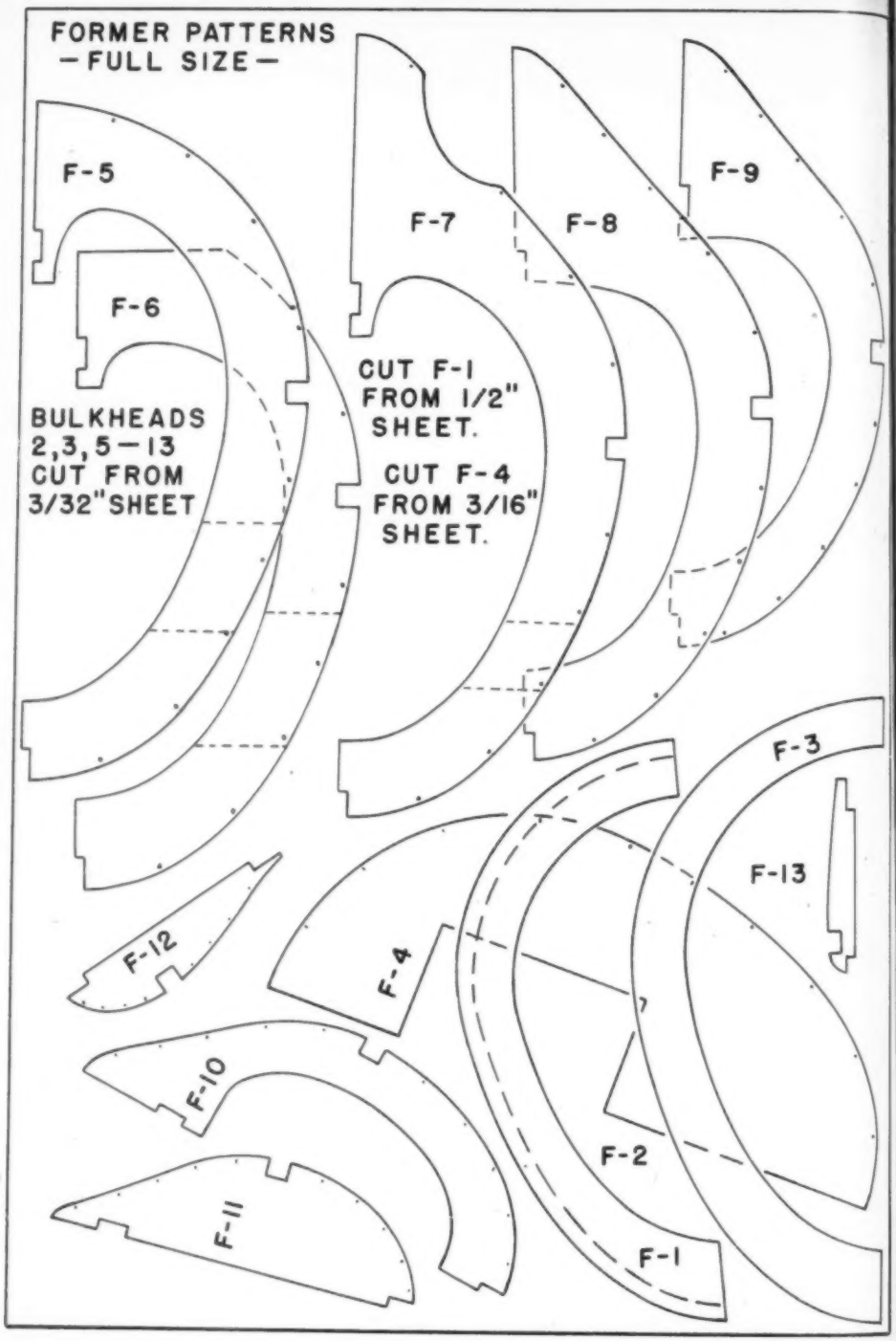
Top front view of completed model. Note machine guns protruding from edge of wings.

PLANKING OR STRINGERS

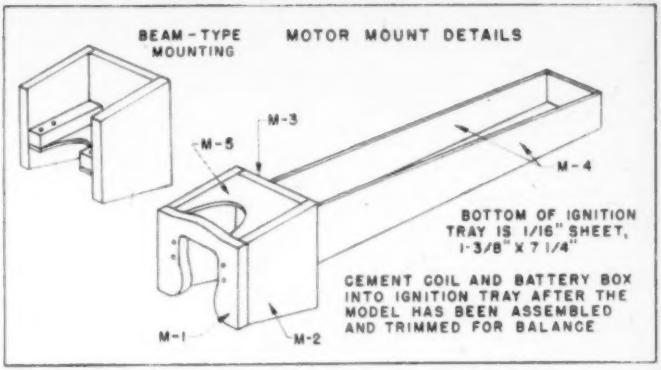
WIRE COCKPIT FRAME IS



Details of fuselage assembly. Numbers adjacent to parts identify them, with dimensions shown elsewhere. Be sure that the fuselage framework is accurate to provide base for smooth finishing job.


FORMER PATTERNS
—FULL SIZE—
F-5
F-6
F-7
F-8
F-9
BULKHEADS
2,3,5—13
CUT FROM
3/32" SHEET
CUT F-1
FROM 1/2"
SHEET.
CUT F-4
FROM 3/16"
SHEET.
F-3
F-13
F-12
F-4
F-10
F-2
F-11
F-1

Motor mount details. Mount may be suited to engine used if same type as in original is not employed. See plan.


BEAM-TYPE MOUNTING
MOTOR MOUNT DETAILS
M-3
M-5
M-4
M-1
M-2
BOTTOM OF IGNITION TRAY IS 1/16" SHEET, 1-3/8" X 7 1/4"
CEMENT COIL AND BATTERY BOX INTO IGNITION TRAY AFTER THE MODEL HAS BEEN ASSEMBLED AND TRIMMED FOR BALANCE

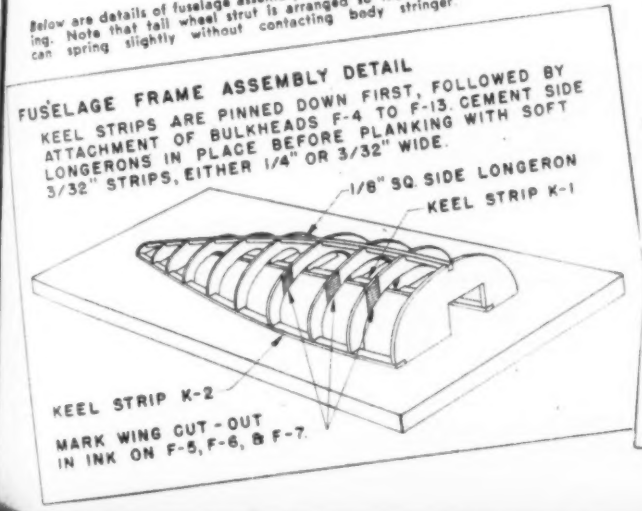
Fuselage

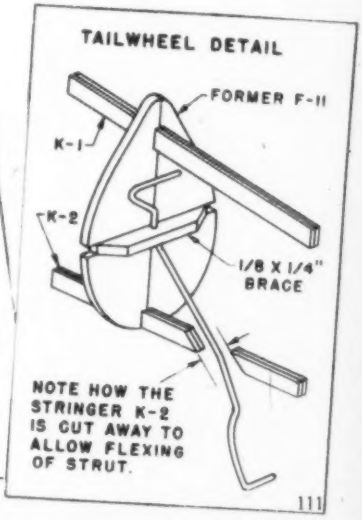
The fuselage is built first. Cut out the keel strip K-2 from $\frac{1}{16}$" sheet balsa. After cutting out the formers shown on the full size plan, assemble them over keel strips K-1 and K-2 at the distances indicated on the fuselage assembly drawing. Be careful to keep all the formers lined up accurately so that a smooth outline will be had when the model is covered. Note that the fuselage may be planked or covered in the orthodox manner with stringers and tissue. Remember that if the stringer type of construction is used, small dots should be marked on each former to indicate stringer spacing. Naturally, on the planked version, these marks are insignificant and should be ignored. In any case, be sure to mark F-5, F-6, and F-7 in ink where the wing passes through, so that the wing can be mounted accurately later. After the $\frac{1}{8}$" sq. side stringer is cemented on, the half-fuselage should be planked on the stringers applied. This should be done while the fuselage is still pinned to the bench. After the cement has dried, remove the fuselage half and cut out the wing opening. The other half of the fuselage can now be assembled to the first and covered. Those building the stringer version will note that the area around the wing should be filled in with scrap $\frac{3}{32}$" sheet, so that the wing opening may be cut there. After sanding off all irregularities, lay the fuselage aside.

Wing

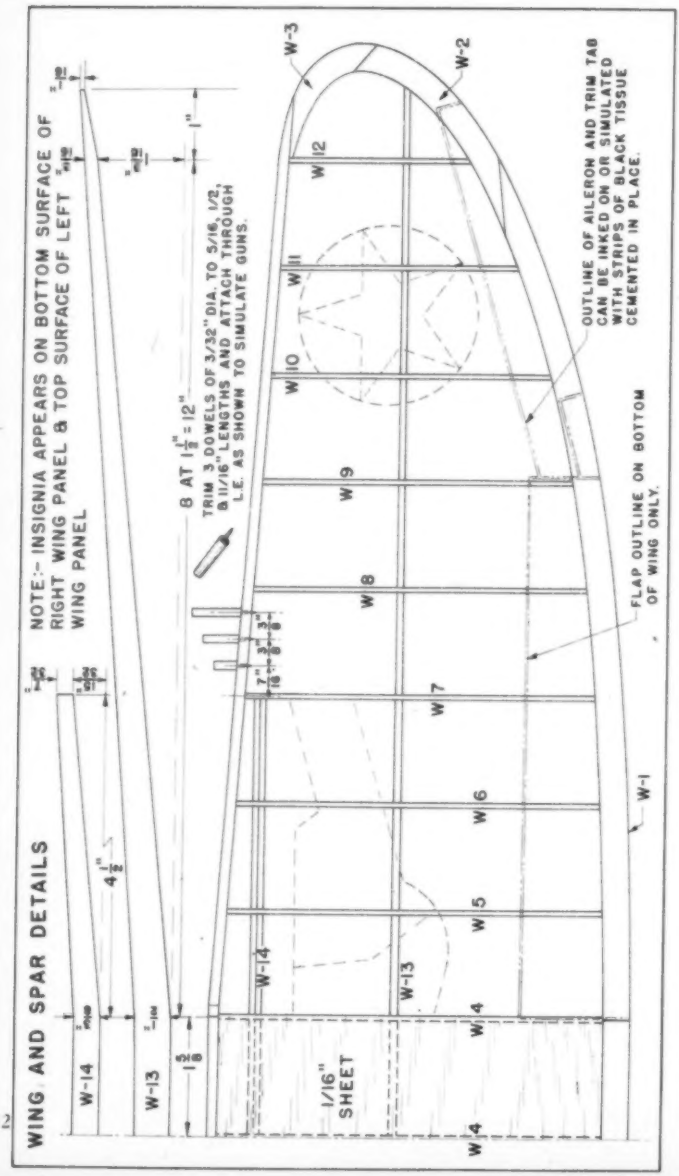
Since all ribs are given full size, most of the hard work is eliminated in making the wing. It is important that the landing gear struts be left off the wing until the wing has been mounted in the fuselage. After the ribs have been cut out, the spars are started. First, cut one W-13 and two W-14 spars from $\frac{3}{32}$" sheet. Splice the two W-14 spars together and then assemble the center section. After the three W-4 ribs are in place, cover the top center section with $\frac{1}{16}$" sheet with the grain running spanwise. Now tip down the right end of the spar until it is flat on the workbench. Slip the ribs on at the correct spacing (W-5 to W-12) and cement. A $\frac{1}{8}$" strip about $\frac{3}{8}$"

Below are details of fuselage assembly and tailwheel mounting. Note that tail wheel strut is arranged so that wheel can spring slightly without contacting body stringer.


FUSELAGE FRAME ASSEMBLY DETAIL
KEEL STRIPS ARE PINNED DOWN FIRST, FOLLOWED BY ATTACHMENT OF BULKHEADS F-4 TO F-13. CEMENT SIDE LONGERONS IN PLACE BEFORE PLANKING WITH SOFT 3/32" STRIPS, EITHER 1/4" OR 3/32" WIDE.
1/8" SQ. SIDE LONGERON
KEEL STRIP K-1
KEEL STRIP K-2
MARK WING CUT-OUT IN INK ON F-5, F-6, & F-7.



Three-quarter rear view of model. Insignia may be paper, obtainable in model stores, or hand painted.


WING AND SPAR DETAILS
NOTE:- INSIGNIA APPEARS ON BOTTOM SURFACE OF RIGHT WING PANEL & TOP SURFACE OF LEFT WING PANEL
8 AT 1 1/2" = 12"
TRIM 3 DOWELS OF 3/32" DIA. TO 5/16, 1/2, & 11/16" LENGTHS AND ATTACH THROUGH L.E. AS SHOWN TO SIMULATE GUNS.
OUTLINE OF AILERON AND TRIM TAB CAN BE INKED ON OR SIMULATED WITH STRIPS OF BLACK TISSUE CEMENTED IN PLACE.
FLAP OUTLINE ON BOTTOM OF WING ONLY.
W-1
W-2
W-3
W-4
W-5
W-6
W-7
W-8
W-9
W-10
W-11
W-12
W-13
W-14
1/16" SHEET

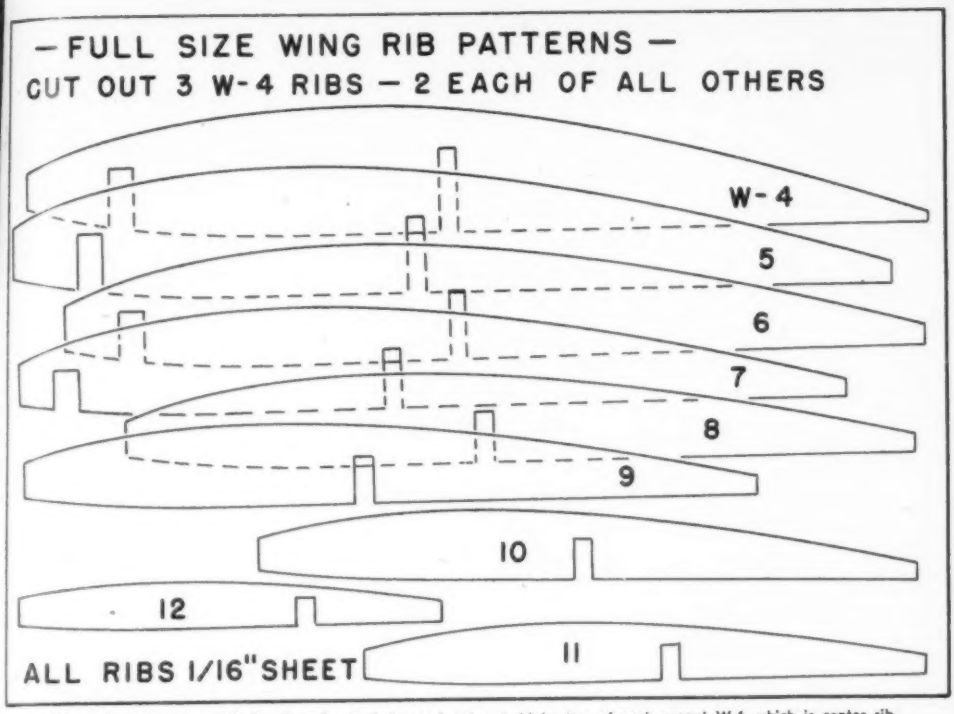
wide is now cemented on for a leading edge (later trimmed to proper rounded shape). W-1, W-2, and W-3 should now be cut out of 1/8" sheet and assembled to wing frame. Now that the right panel is complete, remove all pine and tip down the left end of the spar. Construction is similar to that used for the right panel. The finished wing should be sanded and covered with a light grade of Silkspan.

Tail Surfaces

Using soft or medium 1/32" sheet, cement enough pieces together to obtain a 5x15" rectangle. Upon this trace the stabilizer and rudder outlines. After cutting out the parts, use sandpaper to round off the leading edges and to taper the trailing edges. Use two coats of clear dope on the tail surfaces and then assemble the elevator to the stabilizer with a strip of tape.

Assembly

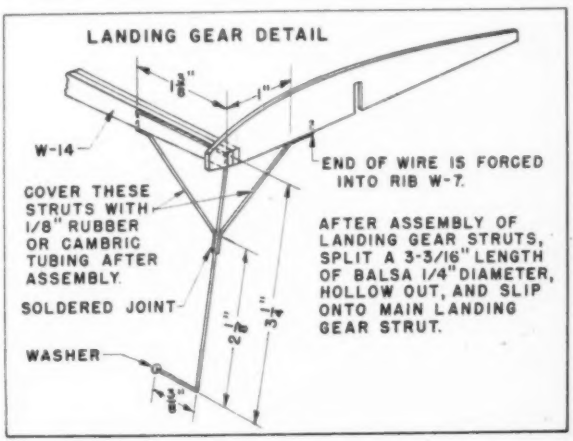
Assemble the fuselage and wing by slipping the wing through the holes previously cut in the fuselage. When alignment has been checked, cement all joints where the wing

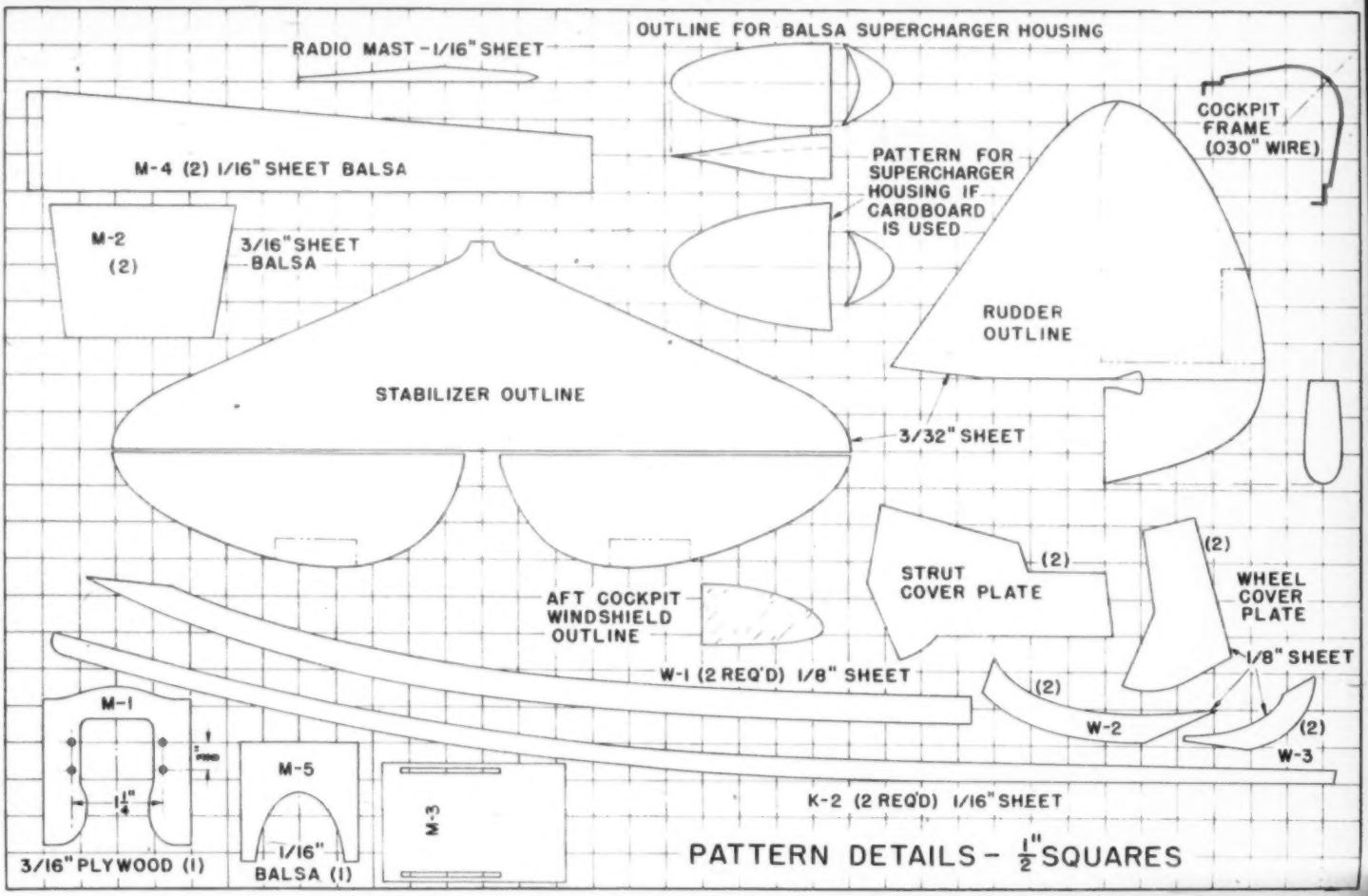


Wing ribs above are full size. Transfer to balsa and cut out. Make two of each except W-4, which is center rib.

contacts the fuselage. By utilizing the motor mount hole in F-4, you can use your cement stick to dab on plenty of cement inside the fuselage. The landing gear can now be assembled as per the dimensioned sketch. Plain wire will do, but appearance will be enhanced if the struts are covered with tubing to simulate the large struts on the prototype. The strut cover plates are now cemented in place, as are the wheel cover plates. The wheel cover plates are cemented to the bottom of rib W-4. The tail surfaces are now cemented to the fuselage, care being exercised that they do not shift in position before the cement dries If desired, a fillet can be obtained about the wing, stabilizer, and rudder roots by using Plastic Wood, formed into the desired shape before it dries. The cowling will vary with the type of engine used. It is best to split it along the horizontal centerline. Cement the bottom half to F-4 and cut a small opening in the bottom to allow excess oil to drain out. The upper half should be fastened on with a tape hinge, so that it can be swung open for engine adjustments. A rubber band or dress snap should be employed to keep the cowl closed while the model is in flight.

The motor mount should be assembled from hard balsa wood, since it will be handled frequently. All the necessary parts are shown


LANDING GEAR DETAIL
1 3/8"
1"
W-14
END OF WIRE IS FORCED INTO RIB W-7.
COVER THESE STRUTS WITH 1/8" RUBBER OR CAMBRIC TUBING AFTER ASSEMBLY.
AFTER ASSEMBLY OF LANDING GEAR STRUTS, SPLIT A 3-3/16" LENGTH OF BALSA 1/4" DIAMETER, HOLLOW OUT, AND SLIP ONTO MAIN LANDING GEAR STRUT.
SOLDERED JOINT
2 1/8"
3 1/4"
WASHER
3/8"



Squared outlines of tail assembly and accessories. Transfer to full size on balsa and cut out as with ribs.

Side view photo of completed model. Looking like the real thing, it can be flown like it, too—on its U-control lines.

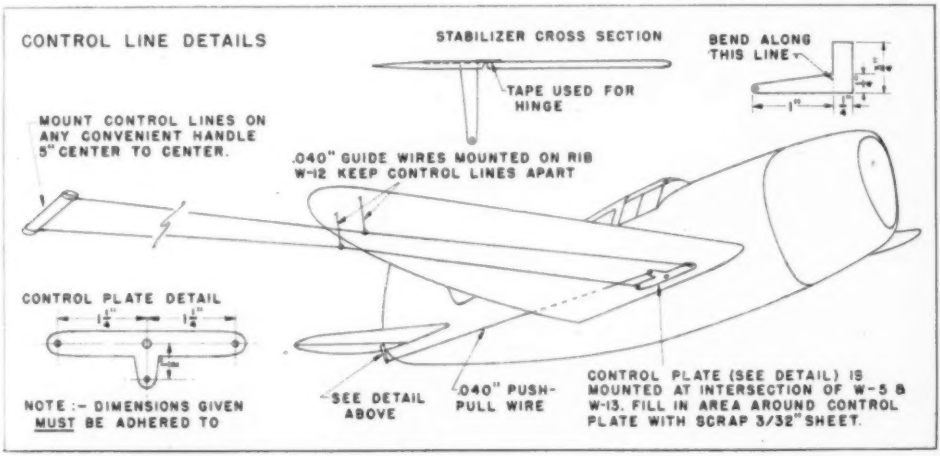
for mounting an Elf "Single," but if an "Atom" or other beam-mounted engine is employed, merely eliminate part M-1, Cement two short lengths of $\frac{5}{16}$" sq. hardwood to the inside faces of the two M-2 gussets, and there you are. M-5, previously on top, now should be cemented under the motor mount beams.

Painting

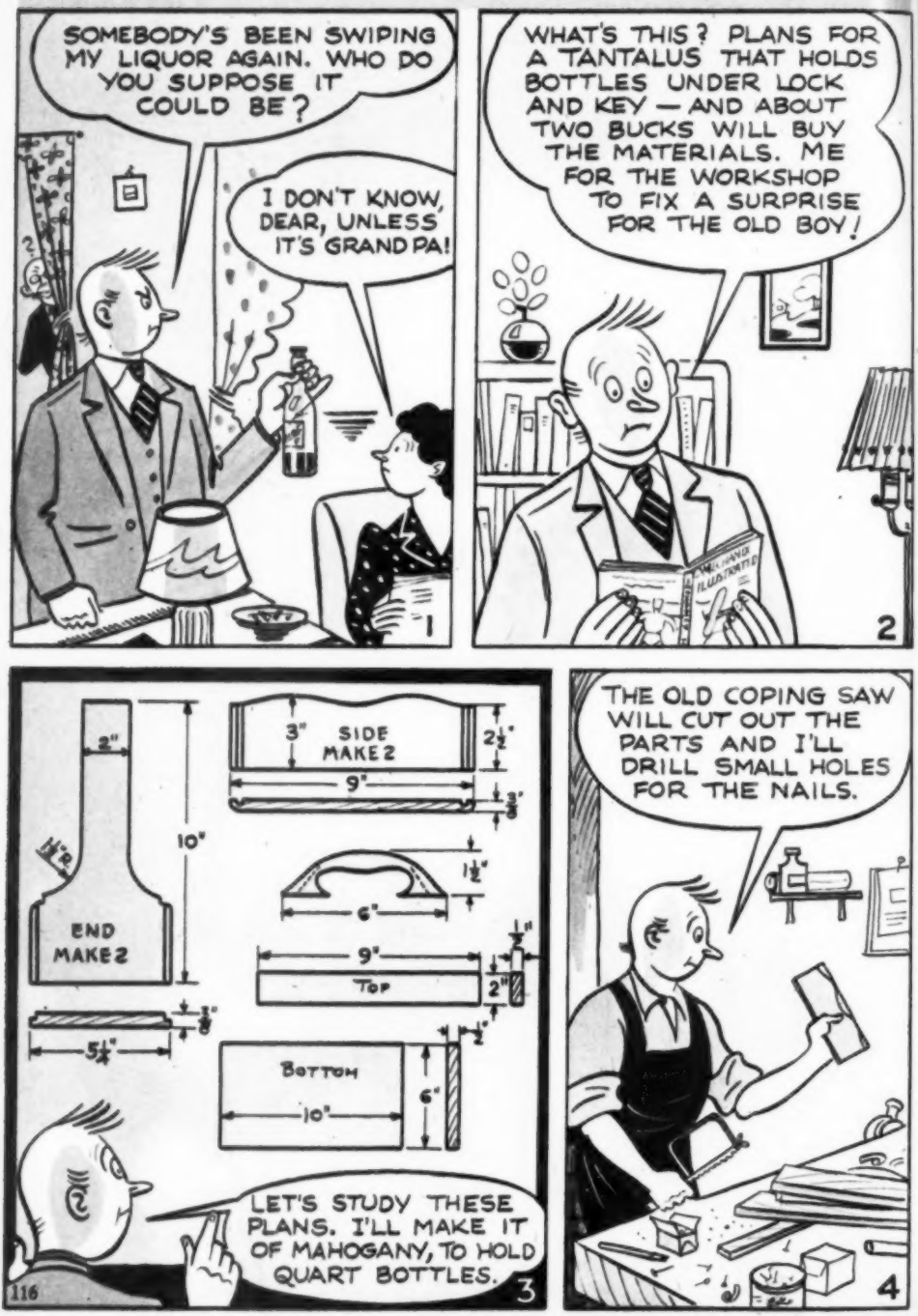
To obtain an authentic war-time camouflage, a spraying outfit will be necessary. If you have access to a motor-driven unit, well and good. If you can't beg or borrow one, you will still be able to do a neat job by using a mouth sprayer of the type employed by artists for spraying "Fixatif" onto chalk sketches. In either case, you will have to thin out the dope to obtain a fine spray. Three coats of light blue are first sprayed onto all undersurfaces. Now, using the sprayer, start the dark green portion, which extends along the fuselage between the wing and the stabilizer. Working carefully, allow the green to blend with the light blue. This is done by holding the sprayer far away from the work, allowing a fine wide, fan-shaped spray to reach the work. The top of the wing, tail surfaces and fuselage are now doped green, full strength. After the dope has dried, the black trim can be applied. This applies to the lettering "U. S. ARMY," tires, landing gear wells, wing guns, cockpit outlines, and all control surface outlines. Standard "star-in-circle" insignia is now applied, one to each side of the fuselage, one to the top of the left wing, and one to the bottom of the right wing panel.

Notes on Control-Line Flying

First of all, parts used in control-flying should be made accurately, without any "play" or "backlash." [*Continued on page* 151]


CONTROL LINE DETAILS
STABILIZER CROSS SECTION
TAPE USED FOR HINGE
BEND ALONG THIS LINE
MOUNT CONTROL LINES ON ANY CONVENIENT HANDLE 5" CENTER TO CENTER.
.040" GUIDE WIRES MOUNTED ON RIB W-12 KEEP CONTROL LINES APART
CONTROL PLATE DETAIL
NOTE :- DIMENSIONS GIVEN MUST BE ADHERED TO
SEE DETAIL ABOVE
.040" PUSH-PULL WIRE
CONTROL PLATE (SEE DETAIL) IS MOUNTED AT INTERSECTION OF W-5 & W-13. FILL IN AREA AROUND CONTROL PLATE WITH SCRAP 3/32" SHEET.

BILL BILDIT TANTALIZES

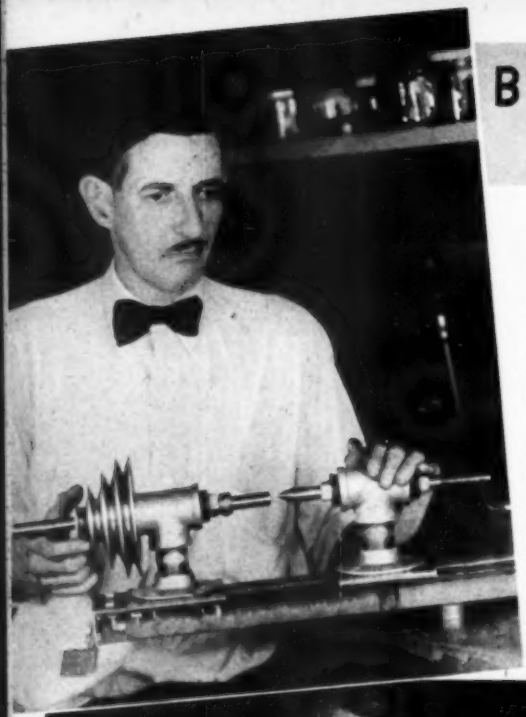

SOMEBODY'S BEEN SWIPING MY LIQUOR AGAIN. WHO DO YOU SUPPOSE IT COULD BE?
I DON'T KNOW, DEAR, UNLESS IT'S GRANDPA!
1
WHAT'S THIS? PLANS FOR A TANTALUS THAT HOLDS BOTTLES UNDER LOCK AND KEY — AND ABOUT TWO BUCKS WILL BUY THE MATERIALS. ME FOR THE WORKSHOP TO FIX A SURPRISE FOR THE OLD BOY!
2
2"
10"
END MAKE 2
3" SIDE MAKE 2
2½"
9"
⅜"
1½"
6"
9"
TOP
1"
2"
½"
5½"
⅜"
BOTTOM
10"
6"
LET'S STUDY THESE PLANS. I'LL MAKE IT OF MAHOGANY, TO HOLD QUART BOTTLES.
3
THE OLD COPING SAW WILL CUT OUT THE PARTS AND I'LL DRILL SMALL HOLES FOR THE NAILS.
4

GRANDPA

GLUE AND NAILS WILL HOLD THE SIDES AND ENDS TOGETHER. THIS SKETCH SHOWS A GOOD JOINT. A GLUING JIG KEEPS IT TIGHT UNTIL DRY.
FOR VICTORY
BUY UNITED STATES WAR BONDS AND STAMPS
DETAIL of JOINT.
GLUE
5

The *Tantalus* which holds a bottle or bottles of precious liquid under lock and key takes its name from the mythological Greek character who, for his sins, was stricken with a fearful thirst and was compelled to stand near a cool and beautiful lake whose waters receded beyond his reach every time he tried to drink. The word "tantalize" is derived from the same source.

The *Tantalus* on sale in fine shops today is a costly article of finely worked metal, sometimes silver plated, and holding two or more expensive cut glass bottles. They range in price from about $25 to over $100. But the antique *Tantalus* was usually made of fine wood and it is suggested that the home craftsman confine his efforts to that type because of metal shortage.



BUILD A WOOD T

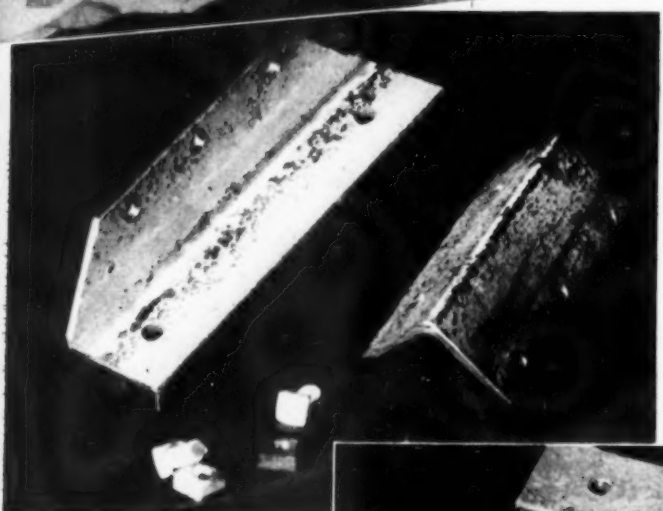
by William J. Burton

IN THESE days of shortages and priorities, it is almost impossible to buy machinery without a priority number, and if you have one, almost impossible to find what you want.

The lathe described in this article will swing six inch stock over a forty inch bed. Both the swing and length of the bed may be changed to suit the builder.

The following materials are needed:

2—iron bed rails—or—10 ft. 1½"x1½" angle iron
2—pieces cold rolled steel 4x4x¼ inches
1—piece cold rolled steel ¾x1¼x10 inches
8 inches ½ inch round cold rolled steel
10 inches ⅝ inch round cold rolled steel
2—1 inch floor flanges
2—1 inch nipples (short) 2 inches long
2—1 inch T's
4—1 inch pipe plugs
1—½ inch collar
1—½ inch thrust bearing
2—5 inch four step V pulleys
2 doz. ¼ inch flat head bolts
3 doz. 3/16 inch machine bolts

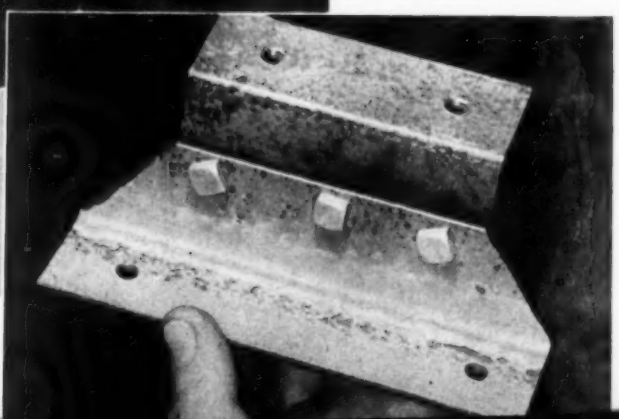


The bed should be built first. If you have a pair of old iron bed rails about the house, they are excellent for this purpose. If not, substitute 1½"x1½" angle iron. The length of the bed is of course up to you, but it is not advisable to make it over four feet long, without using heavier bed irons. The dimensions given here are forty inches.

Cut the two long pieces from one rail, as shown in the diagram (Fig. 1), and save the other rail to

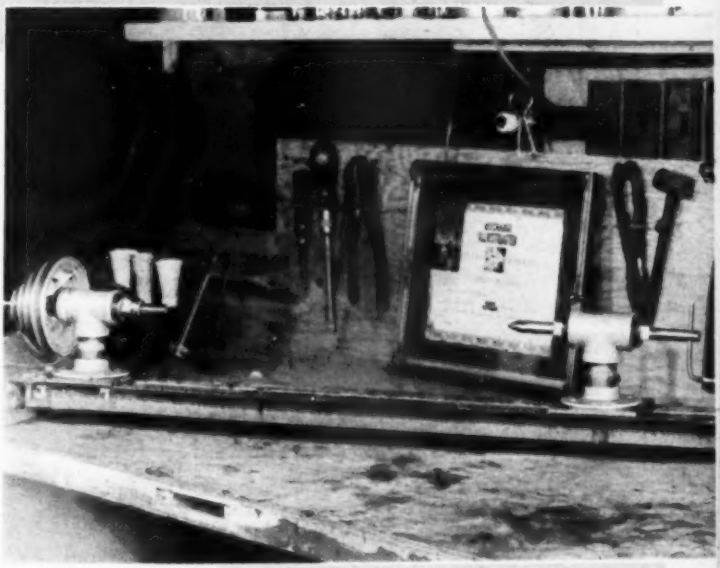
Leg and bracket, drilled and ready for assembly. These are cut from bed rails, as is lathe bed.

Right: Leg and bracket assembled with quarter-inch bolts.



TURNING LATHE

Sturdy power tool easily made.



Bed may be made as long as desired, though forty inches is recommended as an efficient length.

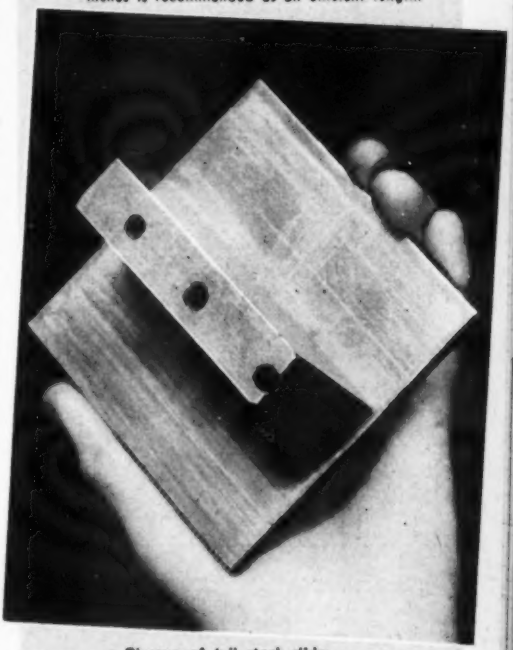
make the legs and leg brackets.

Cut two pieces from the bar of ¾"x1¼" steel, 1½" long. Place one block on each end, between the bed rails, hold them in place, level the top with a square, then put a clamp about three inches from each end, and tighten good and tight. Make a punch mark on the rail about the center of each block, and, without removing the clamps, drill a ¼" hole, one on each end, through rails and spacer blocks. Before removing the clamps, drive (and you'll probably have to) a ¼" bolt through each end. Put on a nut, and tighten as much as possible. Now take off the clamps.

The legs and brackets are next. Cut two pieces of bed rail each 6" long, mark, cut, and drill as shown in Fig. 1-A. Cut two more pieces 3¾" long, and drill as shown in the diagram. The two short pieces bolt to the bed rails, while the longer ends of the other two pieces, are bolted to the bench. The bolt holes which connect these two pieces, can be drilled within ¼" of the edge, if desired, thus eliminating the use of blocks beneath the legs, by raising the bed up enough to allow for the lock nut on the tail stock.

Next make the slide (Fig. 2), for the tail stock. Mark a center line on one of the 4"x4"x¼" steel plates, and drill three ¼" holes, one of which should be dead center. Countersink for ¼" flat head bolts.

Cut a piece of 1¼"x¾" steel, about 3½" long. One corner can be cut off as shown in the diagram, or it can be left square. Mark a line down the center, on the long edge. Lay the steel plate on this, and mark the holes. Drill and tap for the ¼" flat head bolts. The center hole must be drilled and tapped clear through, as this takes the lock bolt from beneath. Bolt the two pieces together tightly,



Closeup of tail stock slide.

Left: Drilling out bearing plug. Vise is attached to drill press table.

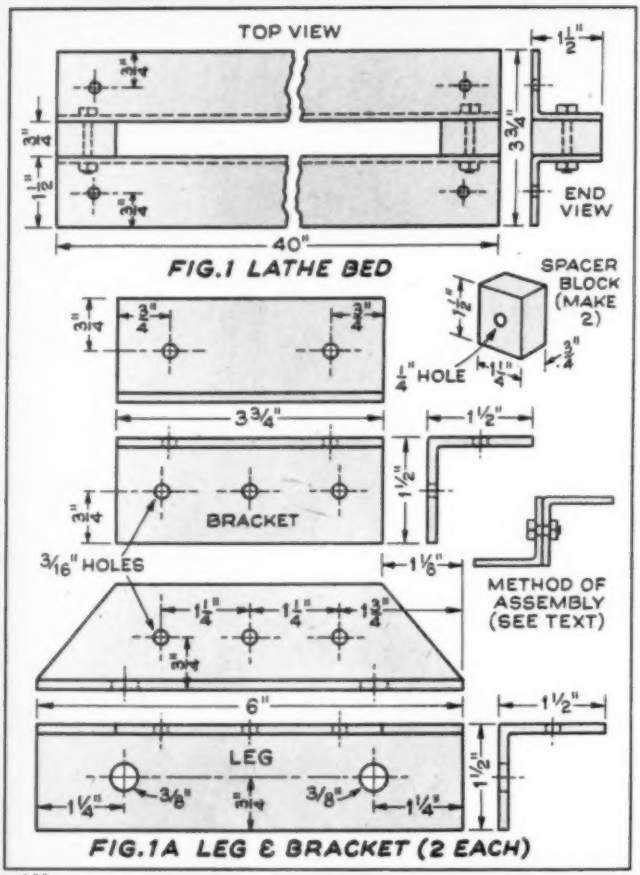


FIG.1 LATHE BED

FIG.1A LEG & BRACKET (2 EACH)

and be sure that the heads are flush. Slip this unit in the bed slot, and see if it slides freely. If not, it may be necessary to file it down a little. Now put this piece aside.

The other 4″x4″x¼″ plate bolts on the opposite end of the bed, and acts as a base for the head stock. Drill the holes close to the corners, or countersink for flat head bolts.

Now for the tail stock. Bolt or screw a 1″ floor flange to the work bench, or other strong support. Now, if more swing is desired, screw a longer nipple than the 2″ one called for into the flange, and add a T. If you have a short length of 1″ pipe handy, screw it into the T, and start turning. Pull it up good and tight. Leave the whole thing screwed to the bench.

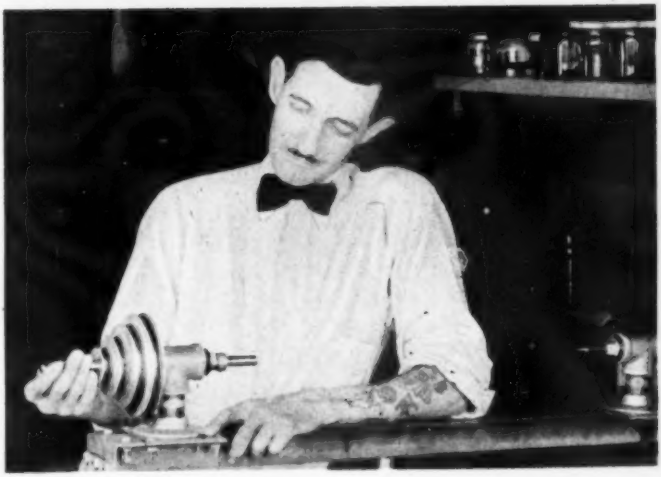
Pipe plugs are used for bearings, these are cast iron, 1¼″ long, which will give 2½″ of bearing surface.

These plugs must be drilled out for the spindles, preferably on a lathe. But if you are careful, and have an accurate drill press, the job can be done on that. The two plugs for the live spindle are drilled ⅝″. For the tail stock, one is drilled ½″, the other, a little under, as this one must be tapped ½″, S.A.E. If the plugs are to be drilled on a drill press, be very careful in marking the centers, as any variation will throw the spindle out of line, and cause it to bind.

Assuming that you have all the plugs drilled, and one threaded, put the two with the ⅝″ holes aside. Screw the other two into the T, as shown in Fig. 3.

The tail stock spindle (Fig. 3), is made from a piece of cold rolled steel, ½″ in diame-

Right: Height of swing is determined by length of nipple between head stock and base plate. Pulleys are standard.



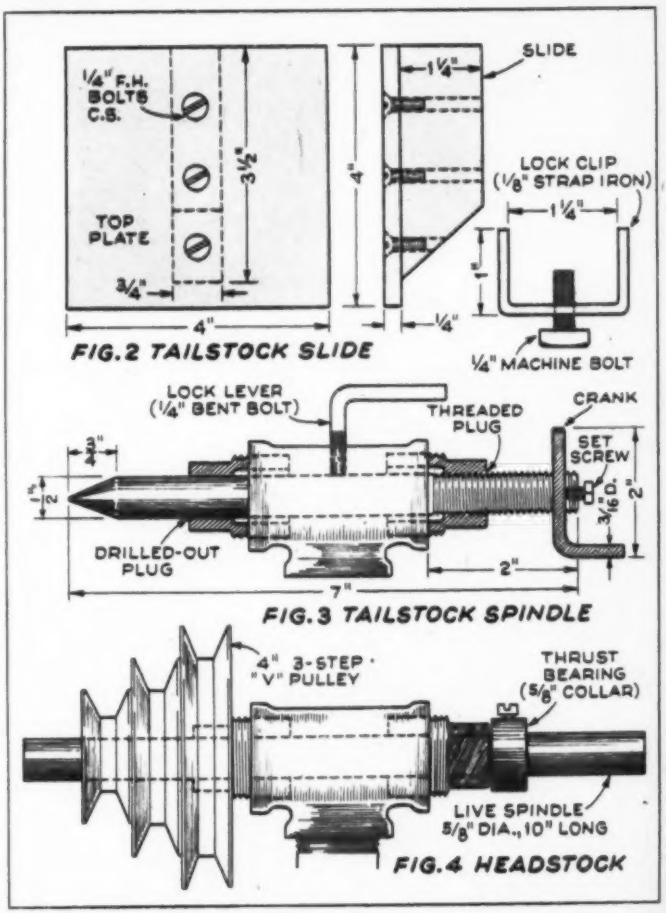
ter, and 7" long. A sixty degree taper should be turned on one end, or it may be ground down on a stone.

Drill a $\frac{3}{16}$" hole about $\frac{1}{4}$" from the opposite end, for the crank which moves the spindle in and out, and another one, horizontally through the end, which is to be tapped for the set screw which holds the crank in place. Now put the spindle in a vise, and run an S.A.E. thread 2" down from the square end. Remove from vise, and insert in the drilled plugs, threaded end first, through the bearing to the threaded plug. From then on screw it through. Make up the crank as shown in the diagram, put it through the $\frac{3}{16}$" hole and lock it in the desired position. Now remove the whole unit from the bench, and drill and tap for the lock lever, as shown.

While you are working on the tail stock, you may as well make the clip which locks the unit in working position. This can be made from any piece of scrap iron about 4" long. Simply drill a $\frac{3}{16}$" hole in the center, and bend U shaped, just a little wider than the angle iron and slide block. This bolts to the center hole in the slide, from beneath.

Assemble the head stock just as you did the tail stock. Pull all fittings up just as tight as possible. Put in the plugs. Slip the $\frac{5}{8}$" shaft through the bearings, leaving as much as possible

[*Continued on page* 154]

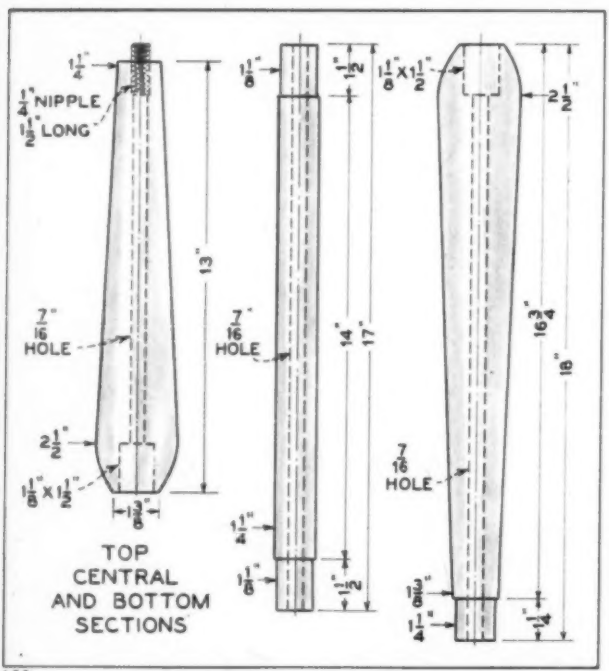


SELF-ADJUSTING

The owner of this modern, good-looking lamp will never need to give a thought to the nearness of a convenient outlet, for there is plenty of reserve cord coiled in its hollow base.

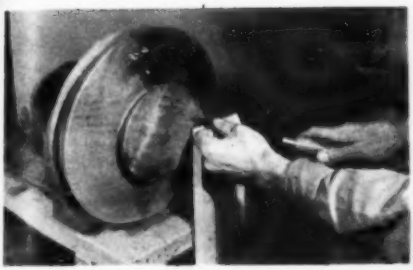
Left: The finished lamp. A reel in the base keeps excess cord neatly coiled out of sight. *Above:* Plenty of cord to reach distant outlets. *Right:* Assembling the standard.

by
Benjamin Nielsen



THE standard, which is made in three pieces, is designed so that it is easily turned to dimensions on a small home workshop lathe. To make true holes for the wire through the tapered sections of the standard each section is rough turned to the same diameter throughout the entire length. Then it is placed in a trough or jig, as shown in photo. Note that bit used for boring hole is welded onto rod to give necessary length and is mounted in the lathe chuck. Starting the lathe at lowest speed, the rough turned section is then slowly fed to the bit and is turned slowly as the boring proceeds. The work will have to be taken off the bit every inch or two to clear the bit of chips. When

FLOOR LAMP



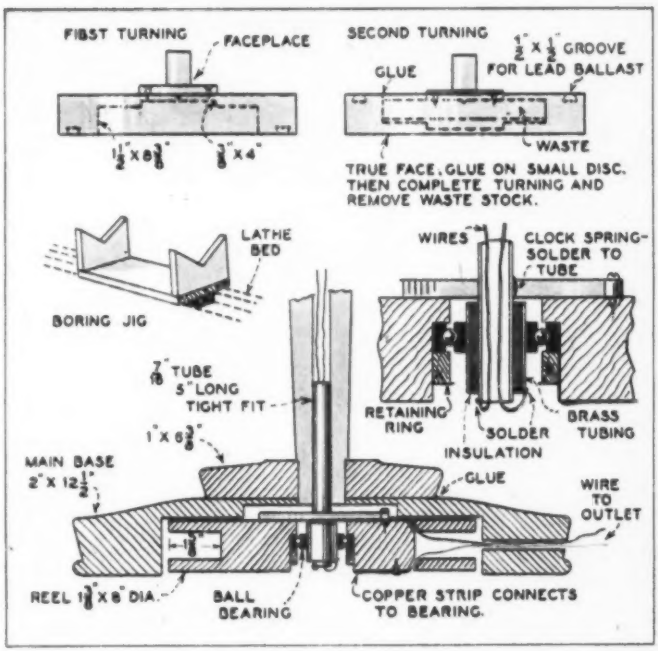
Completing turning of base on outboard end of lathe.

Bearing assembly is placed in reel. Skate wheel could be used.

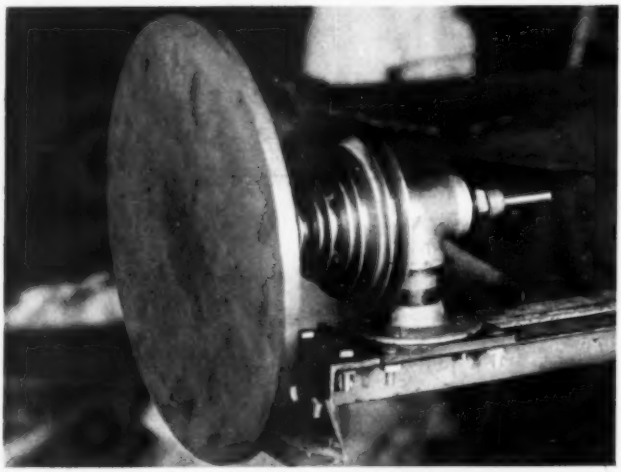
Boring the cord hole in a section of the standard with the aid of a simple jig. Bit is welded to the rod and chucked in lathe.

section is bored half way through, reverse work and start boring at opposite end. After these two sections are finished the middle section is bored using similar jig (see drawing). Now bored sections are plugged by gluing dowels in each end, after which turning is completed, as shown in drawings, so sections fit together. Finish is applied then the dowel plugs are bored out.

Drawings show the details of the turning of the base. Finish is applied before the work is removed from the lathe. Underside of base is turned out for reel.



SHOP SHORTCUTS

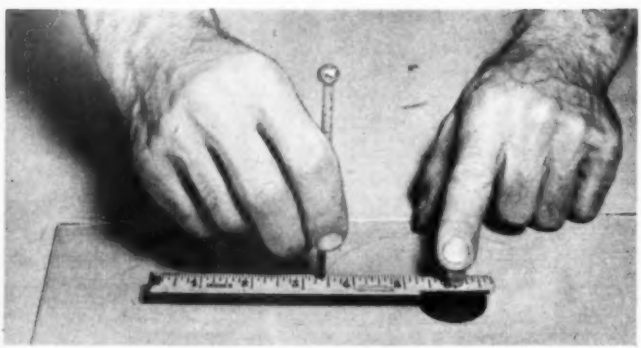


Substitute Sanding Disk

AN OLD discarded phonograph turntable will make an ideal sanding disk if drilled and fitted with set screws to attach to lathe or motor. Abrasives may be stuck on with either shellac or linoleum cement. Such a disk may also be used as a pinch-hit face plate for large outboard turnings. Drill holes or cut slots through the turntable for mounting the work with screws.

Jar Top Opener Made Of Wood

PRESENT scarcity of metal kitchen appliances need not deter you from having a grip for removing sticking jar tops. The one illustrated at right, made of wood strips, is very efficient. The two gripping arms are fitted to the cross arm with dowels, adjustable in several holes of the cross arm so as to accommodate different sized jar tops.

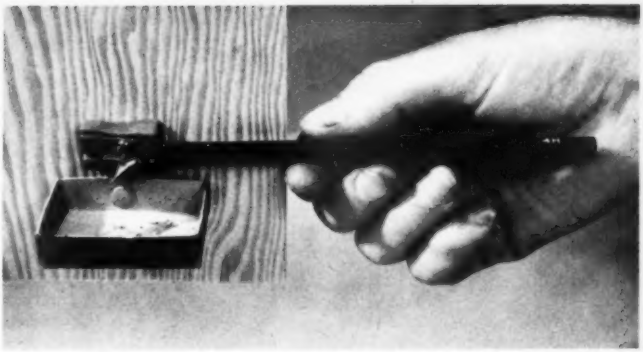


Adjustable Glass Circle Cutter

USING a small rubber suction cup of the type shown and a 6" ruler you can make an adjustable glass cutter which will cut circles in a variety of sizes. Drill a hole in ruler and attach it to cap. Slip a notch of the cutter over the ruler at desired dimension.

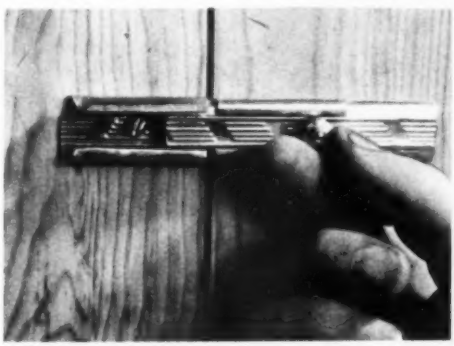
Sharpener Inside Cupboard Door

A FIVE-CENT plastic pencil sharpener can be conveniently mounted inside a cupboard door so as to be ready for use at all times. Substitute a longer wood screw for the blade-holding screw of the sharpener. Match box drawer catches shavings.



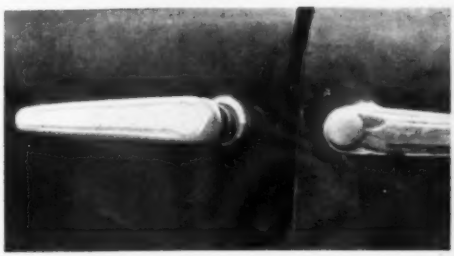
Balloons Protect Locks

WHEN closing the bungalow or storing the car, cover the locks with thin vaseline or grease, then pull toy balloons over them, tying the end with a piece of string. This will keep the parts from rusting and will open easily when necessary. If car is in use in winter a balloon slipped on lock when you park will keep snow and ice out of tumblers.



Gauge From Broken Collet

A BROKEN or otherwise damaged spring collet having a small diameter hole may be easily concerted into an accurate drill grinding gauge by simply cutting off one of the three sections into which the head is divided. This leaves gap with correct angle.



Bolt For Light Doors

WHEN a sliding bolt for locking a light door is not available, a satisfactory substitute can be made from several pieces cut from an old flat curtain rod. Two pieces of the outer section are screwed to the edge of door and casing while one piece of inner section, fitted with a knob, serves as bolt.

DON'T HIDE Y

BECAUSE OF THE PREVAILING TENDENCY TO CONCEAL HOUSE NUMBERS IN THE SHRUBBERY OR ELSE NOT TO PUT THEM UP AT ALL FRED PERLEY NEVER THINKS OF DINING IN A NEW NEIGHBORHOOD WITHOUT TAKING ALONG A FLASHLIGHT AND A SANDWICH OR TWO IN CASE THE SEARCH FOR THE RIGHT HOUSE TAKES UNDULY LONG
GLUYAS WILLIAMS
9-30

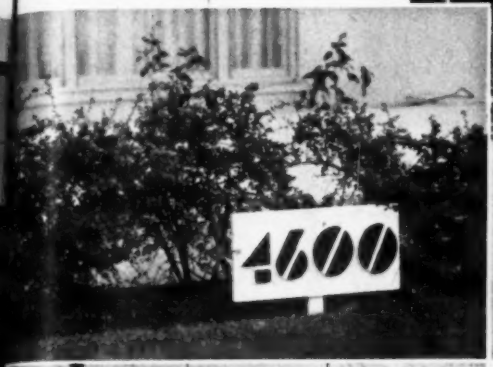
Right: A fine idea for beach homes, or the nautical-minded is this cork buoy number. Rope keeps visitor from being swept overboard on stormy night.

by Hi Sibley

POKING around in the dark is no fun, trying to locate some new address, and visible numbers will eliminate a lot of irritation on the part of callers. In Fig. 1 is a neat, wrought iron job that stands out prominently—especially if given a coat of aluminum or white paint. The letters are welded from ¼-in. by ⅜-in. iron and set in the frame, which can also be used as a mail box support arranged as shown in the dotted lines.

The picturesque rustic is given in Fig. 2—a weathered board with letters burned in, or hand-carved and given a coat of bronze, aluminum or white paint for prominence. Fig. 3 is business-like and forthright—you won't miss this one on any kind of a night, because it has a light bulb controlled from the hall. Lettering in a frame cut from an iron plate and allowed to rust is arresting, and in the original (Fig. 4) was appropriately set in a cactus garden on the front lawn. The monotony of a masonry wall can be relieved

DE YOUR HOUSE NUMBER!

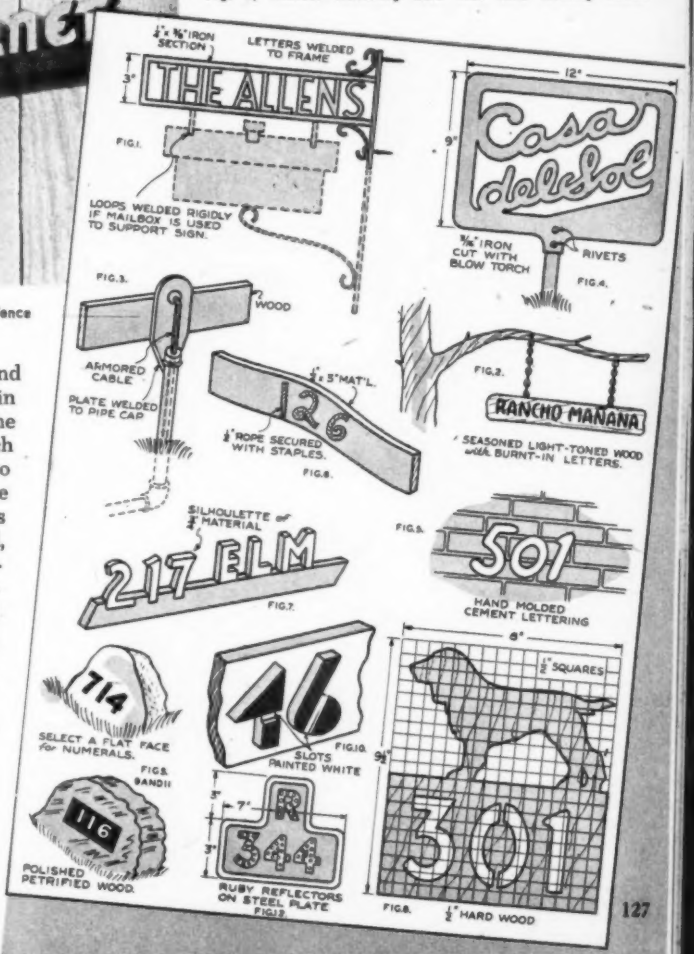


Left: Numbers of a somewhat eccentric type are excellent for certain modern houses. *Above:* This number is shown in Fig. 6, without matching bars that lend striking effect.

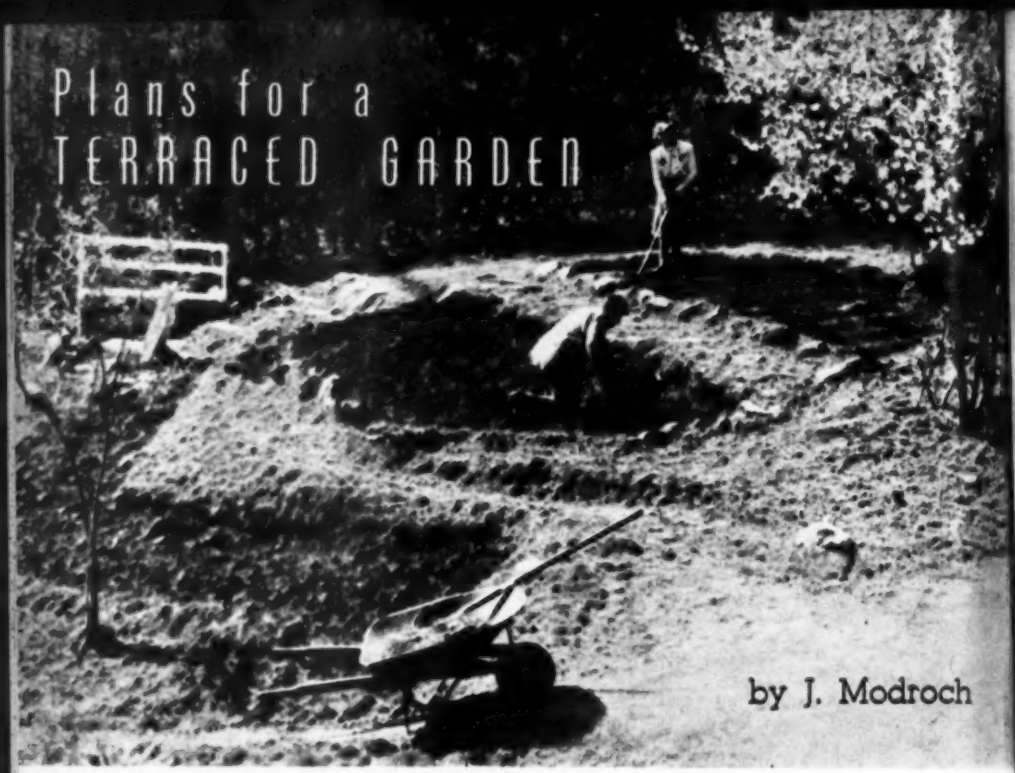
Plywood scroll-sawed and mounted on fence has nice effect, as above.

by rather large letters and numerals hand-moulded in cement, as in Fig. 5. For the door itself, especially a beach home, hemp rope stapled to the panel is effective. Here we have the numerals against a blue ground, giving them unusual prominence, Fig. 6. Three-quarter-inch wood sawed in silhouette makes a novel house number, preferably placed on a solid gate or fence as in the case of Fig. 7. The family pet in hardwood with the number beneath will not be overlooked by newcomers and is easily made on a scroll-saw, Fig. 8.

[*Continued on page* 154]



Plans for a TERRACED GARDEN



by J. Modroch

WHETHER it is used for growing flowers or vegetables, a thoughtfully planned hillside garden will add year round beauty to a homesite. To make a terraced garden fit into the particular plot of ground at hand, every advantage should be taken of the natural aids the land offers for doing the job.

For example, rock ledges and deeply embedded boulders in the garden site shown in Fig. 1 were made to serve as footings and embankment supports for the beds, paths and steps. Until the banks became firm and the border planting was established, certain native bushes, shrubs and saplings were left standing to aid in serving this purpose. Then later they were taken out—with the excep-

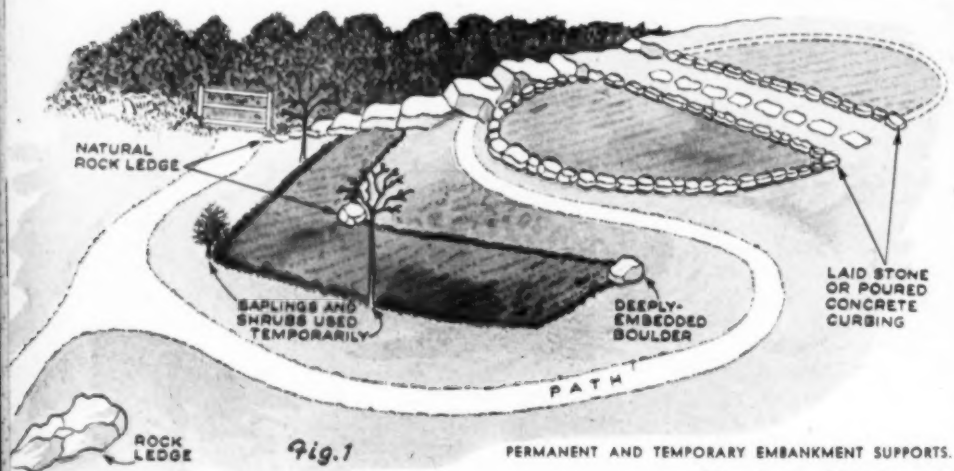


Fig. 1 PERMANENT AND TEMPORARY EMBANKMENT SUPPORTS.

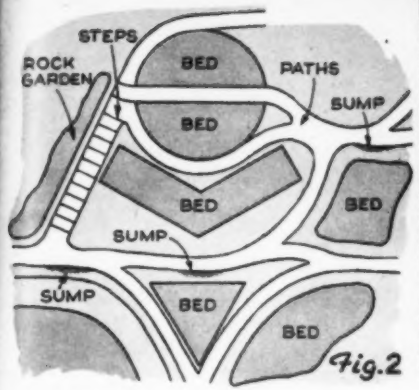


Fig. 2

tion of an occasional one left growing here or there as a permanent decoration. It should be kept in mind, however, that trees or bushes of appreciable size should not be left standing on the sunny side of the garden where they would sooner or later cast shade across the beds.

Paths and steps should be woven into the pattern of the garden as a whole. Place them so that all parts of the beds can be reached easily with a wheelbarrow. One way to accomplish this is to confine steps to only one

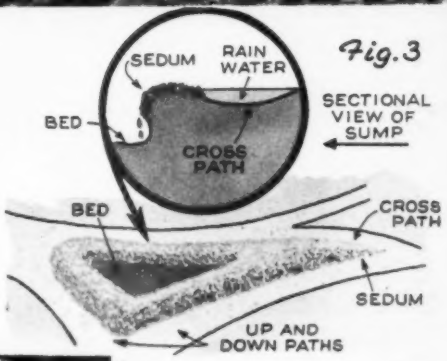
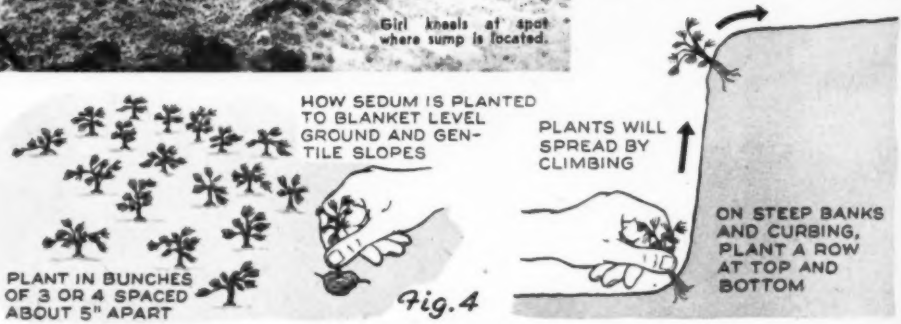
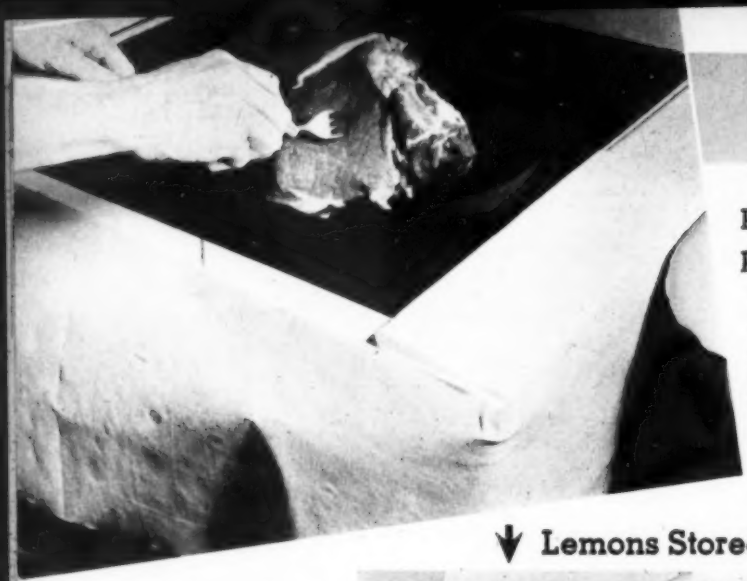


Fig. 3

side of the garden, which will leave all the other approaches stepless for wheelbarrow use as shown in Fig. 2.

To make wheelbarrow travel easy and also to stem erosion, none of the paths should run straight up and down the hillside and not more than two of them should intersect at any one point. Instead, lay out the [*Continued on page* 178]


HOW SEDUM IS PLANTED TO BLANKET LEVEL GROUND AND GENTILE SLOPES
PLANTS WILL SPREAD BY CLIMBING
PLANT IN BUNCHES OF 3 OR 4 SPACED ABOUT 5" APART
ON STEEP BANKS AND CURBING, PLANT A ROW AT TOP AND BOTTOM
Fig. 4

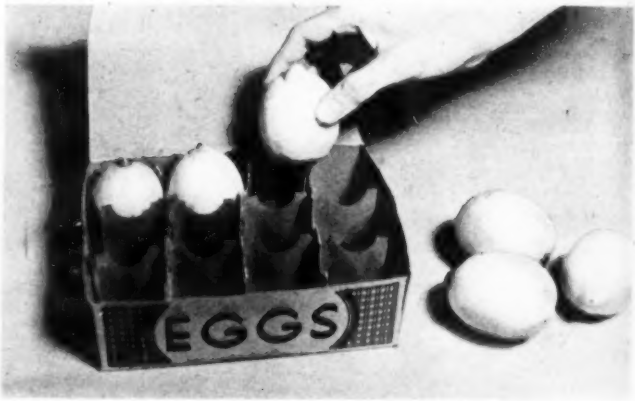


HOME

Paper Towel Protects Stove

IF YOU will cover the knobs and dials of your stove with paper towelling when you fry or sear meats you can avoid a lot of tedious grease-cleaning.

Lemons Stored In Egg Carton



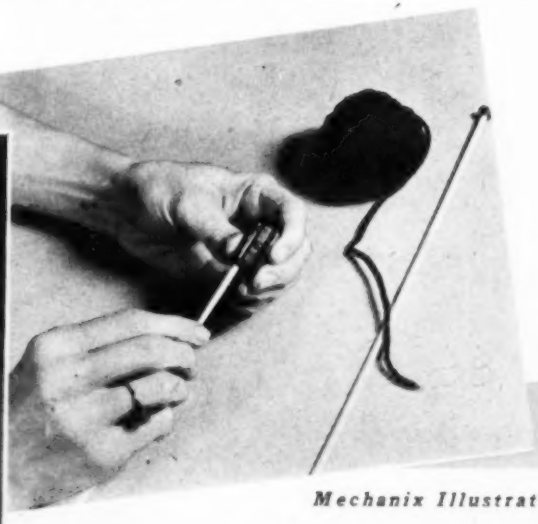
WHEN storing lemons in the refrigerator put them in an egg carton.

Knitting Kink

SHOULD your plastic knitting needle break you can make a new point with pencil sharpener.

Clippings

THOSE who do a lot of newspaper clipping will find the following very handy: A phonograph needle in an automatic pencil is a good scoring tool.



AIDS

French Dressing Catsup Bottle

A CATSUP bottle makes an excellent shaker for blending the ingredients of a French dressing. Measure, pour in ingredients, screw lid on tightly and shake vigorously.

Egg Shell Prevents Scale On Kettle

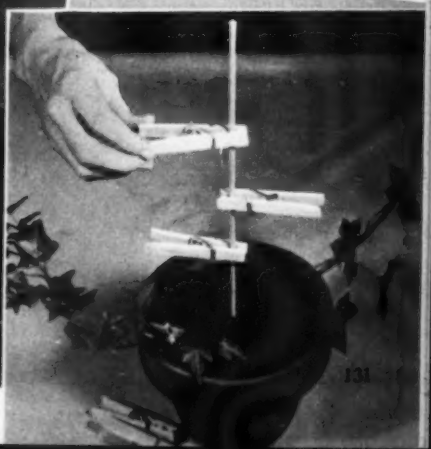
PLACE an egg shell in the tea kettle. Scale will cling to shell and keep kettle clean.

Miniature Trellis

FROM dowel and a few clothespins you can make an excellent miniature flower pot trellis.

Training Dog

TIE a short stick to a length of heavy cord and suspend it from the dog's collar so that it is in line with his knees. Any attempt at chasing cars will prove extremely difficult, and the dog's enthusiasm for this sport soon wanes.

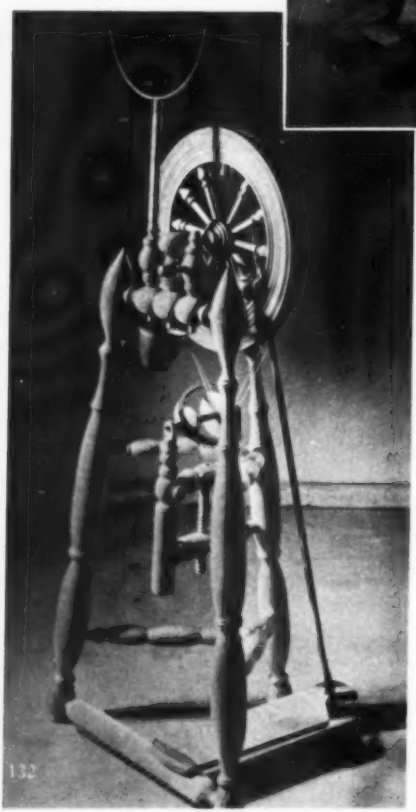


IRISH SPINNING WHEEL

This beautiful wheel will delight the heart of the craftsman who enjoys the finest in woodworking.

by

Edwin Love



MENTION a spinning wheel, and what visions the mind conjures up! Rumplestiltskin, perhaps, spinning gold from straw; Priscilla, busy at her spindle, rosy and winsome under the gaze of John Alden; or some white-haired dame plucking the spokes of her great wool wheel while the ancient grandsire dozes by the hearth. But whatever the picture called up, more often than not the Colonial spinning wheel of sloping bed with the wheel at the lower end is thought of. In fact, however, there were several forms, and the one dealt with here is an unusual example, the "Irish immigrant wheel." It is upright, requiring little floor space, a striking piece in many respects. The original, probably built in 1780, is dark red-brown in color, but the writer built his copy of birch and finished it with clear lacquer.

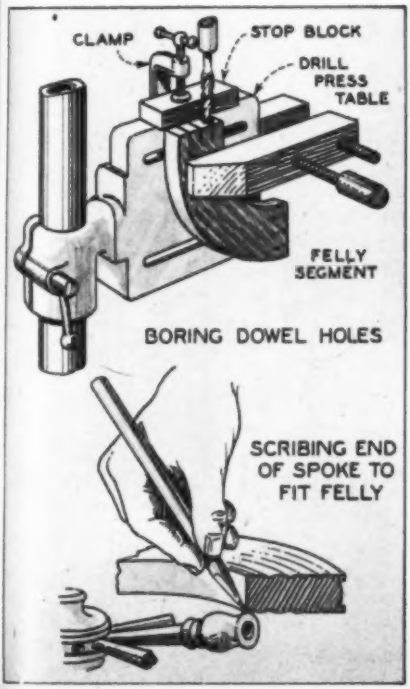
The first step in construction is to cut up the stock, allowing 1" extra length for spindles finished on one or both ends. Band saw the felly segments ¼" overwidth inside and out.

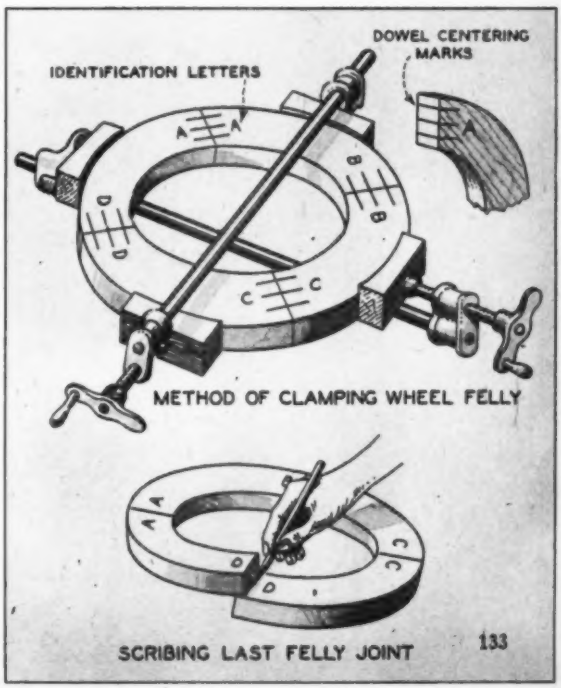
The spindles present no special turning problems. Since there are twelve wheel spokes, time is saved by using a plywood template, as in the

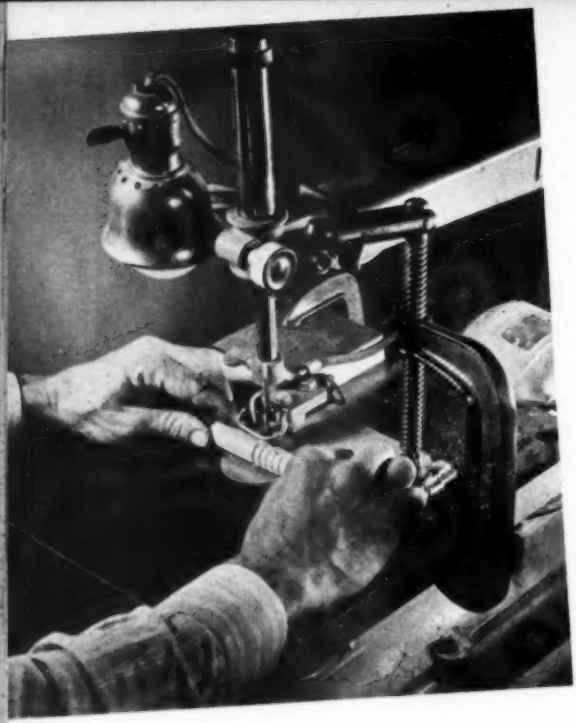
Above: Turning the inner edge of the wheel felly. Note screws in chuck to grip the edges of the blank. *Right:* Boring spoke dowel holes in the felly with aid of a jig in drill press.

photograph. Allow $\frac{1}{32}$" extra length for fitting the spokes to the inside of the felly. Turn the bobbin and wharves from one block, separating the flyer pulley afterward, and lacquer it immediately to prevent checking.

Cut the felly segment ends radially, and try them together. Three joints will probably fit while the fourth does not. This joint can be scribed and finished to the line on a sanding disk. Mark the paired joints and draw center lines on the faces from which to square across the ends to locate the dowel holes. These are bored on the drill press. Assemble the segments in pairs, preferably using water-







Left: Threading belt screw on a scroll saw. The table is tilted to give a lead to the spiral.

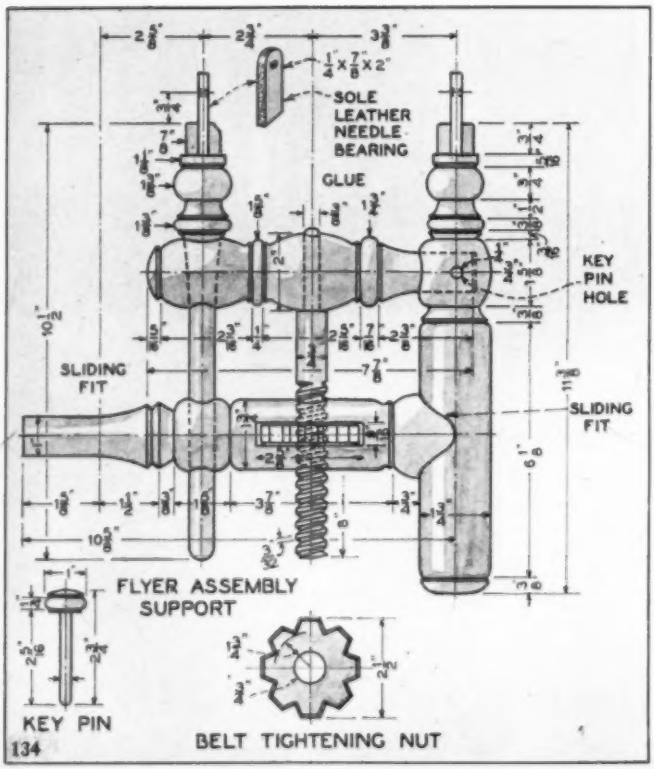
proof plastic glue, then put the pairs together, and stretch bar clamps across opposite segments.

Make a chuck of five-ply stock mounted on a 6" face plate for turning the felly, holding the latter with screws while turning the inside and one face. Screw blocks inside for turning the other face and the rim, and locate the spoke dowel holes with the lathe indexing head.

Cut the threads of the belt screw on the scroll saw, with the table tilted 83° and a notched strip of wood behind the blade for a depth stop. Lay the turned spindle against the blade and rotate it slowly. It will move to the left with the blade cutting a spiral of $\frac{3}{16}$" lead. This done, replace the blade with a three-cornered file, readjust the fence, and file the threads to depth. It will track quite evenly, although a little end pressure may be required now and then.

If stain is used, sponge the parts with warm water to raise the grain, and smooth with fine sandpaper when the surface dries. Then brush on a water stain, and allow to dry for 24 hours.

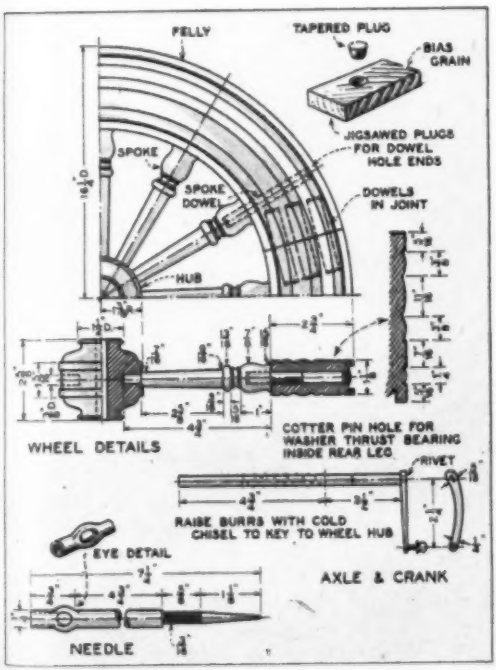
Mount the spindles in the lathe and apply a heavy coat of sanding lacquer sealer of the spraying variety, using a soft brush, and turning the lathe by hand. Contrary to what might be expected, the sealer will flow smoothly, with enough body to stand much sanding. When all spindles are coated the first will be dry enough for sanding. Replace them in the lathe and rub down at slow speed with fine steel wool, a process requiring only two or three minutes per piece. Dust off and brush on gloss spraying lacquer. When all are done, put back in the lathe and rub down lightly, finally polishing with a strip of cloth or the palm of the hand. The silky glow is well suited to a spinning wheel. The open grain of the felly is filled with repeated coats of sealer.

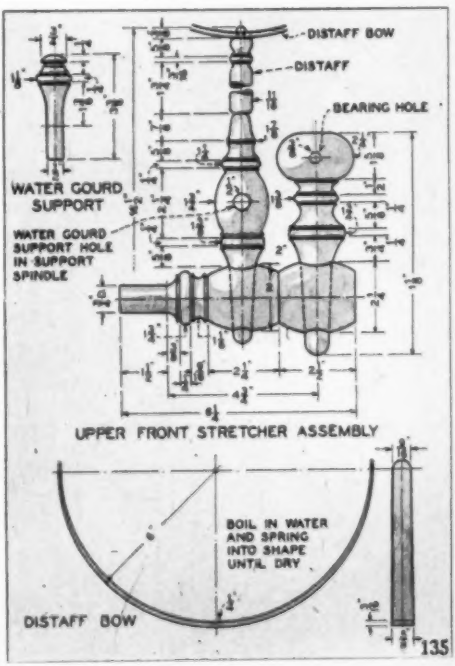


Below: Tapering a stretcher mortise with a round machine file in the drill press. *Right:* Mortises in the front upper stretcher are bored while the piece rests on a V-block, which slides against a second block used for a guiding fence.

Use a V-block to support the spindles when boring the holes. The upper front stretcher should have tapered holes, although stepped holes may be substituted. Bore small pilot holes clear through, bore a shallow hole on top to the large diameter, and finish with the smaller bit. A machine file whirled at highest speed in the drill press completes the taper handily.

To bore stretcher mortises in the legs, tilt





Left: This beautiful photograph shows assembly details of the flyer mechanism. (sketch *below*).

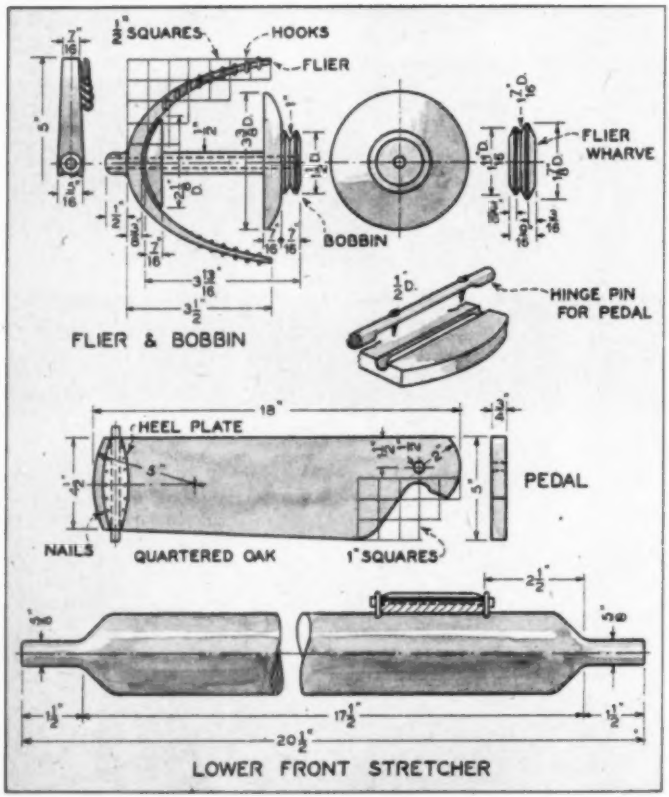
the drill press table to 82½° and bore the lower holes in the front legs. Insert the lower stretcher in one leg and sight across it to guide in boring the upper hole. Then assemble the front legs and stretchers and rest one leg on the drill press while the side holes are bored, as in the photograph, using a plywood template cut to an angle of 52°. Prop up the other leg with the arms. Take the frame apart and bore one pair of holes in the rear leg, assemble with a front leg, and bore the other pair at an angle of 73°.

Scroll-saw the nut mortise in the lower spindle of the flyer assembly support and pass a strip of wood through to guide when sawing out the end. The notches in the tops of the uprights are made to fit bearings cut from pieces of sole leather, which are glued in.

The wheel chuck, removed from the face plate, is useful for clamping the rim to the drill press when boring the spoke dowel holes. Holes in the hub are bored by holding it on a V-block.

To assemble the leg frame, glue the four stretchers into the back leg and enter side and front stretcher tenons at the same time, tapping them with a padded mallet. The joints should be made free to allow some give. Since the mortises are bored at slightly less angles than exact layout calls for, the spring of the stretchers forces opposite legs together.

Assemble the spokes with the hub, drive in the axle, and bore a hole in the center of the felly chuck to admit the axle. Lay the hub and spoke



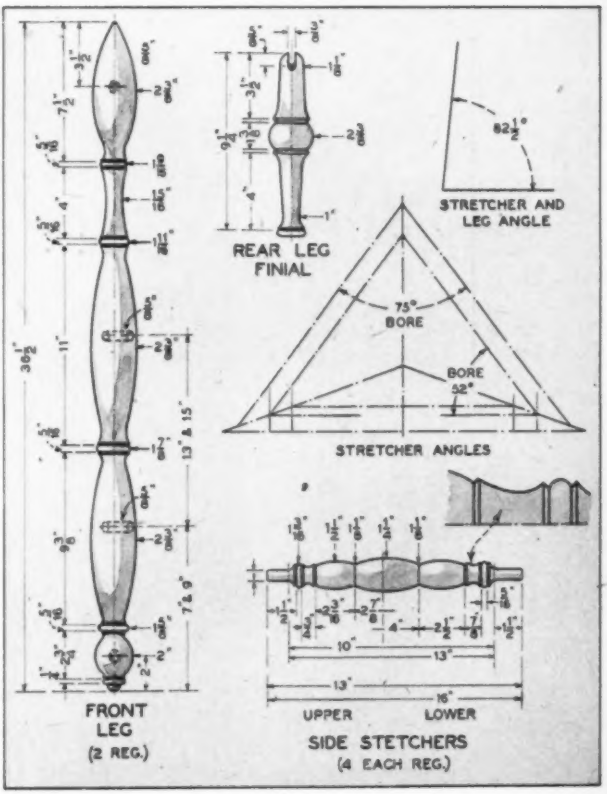
Boring mortises in the front legs. The plywood triangle is a template for the angle of the mortises.

assembly on the chuck, and slip the rim in place, so that long spokes can be scribed to length. Bore the dowel holes and assemble the wheel, driving short glue-coated dowels through the felly into the spoke ends. Long dowels might stick tight before they could be driven home. Conceal the holes with tapered plugs cut with a scroll saw from strips of wood on the bias.

Saw the flier out and drill it for the needle. Bore the star wheel nut and chamfer the teeth. Oil the screw threads and fill them for about 1" with putty made from plastic glue and sanding dust. Coat the nut hole with glue and force it over the putty, tamping the latter in, and allow it to dry for two days, when the nut can be screwed off with the putty threads firmly attached.

Bore the mortise for the screw assembly in the back leg by hand, keeping the hole horizontal and bisecting the back angle of the stretchers.

For the crank bend a ¼" bolt in a [*Continued on page* 154]



IDEAS for SERVICE MEN

Service Man, Stay Sober!

A lot of you youngsters coming into the Navy these days are finding yourselves away from the restrictions of home for the first time in your young lives. Quite a few of you seem to think that getting drunk and making fools of yourselves is a part of the Navy curriculum. We can assure you that this is not so.

It's no honor to a sailor, soldier, or marine to be observed staggering along a street with hat on back of his head, uniform awry, and legs wobbly. If you can't smell a cork, a bar towel or imbibe a few beers or highballs, without becoming drunk and making a fool of yourself publicly . . . then, don't do it.

If you CAN'T handle it — Sailor, Soldier, Marine— DON'T try to take it.

"Airdales" In The Navy

Somewhere in the "A to N," that famous portion of the Bluejacket's Manual which deals with the personal conduct of the Sailor, is a passage which reads:

"The beard and mustache, if worn, shall be neatly trimmed."

—and elsewhere in that same "A to N," another passage reads (quoted from memory):

"No eccentricities of hair, beard or mustache, will be permitted."

* * *

So, the "Boot" sailor, being a patriotic citizen, and desiring to comply with all requirements of his Service, takes heed, and acts accordingly. In training camp he is shorn practically to the dandruff (See Figure 1), and forced, by order of his company commander, to shave daily . . . hence, develops a rebellious instinct, which he reserves for future use.

Getting into the Group I Schools, and there *forced to study* his "A to N" for the first time, he discovers the passage first quoted above, gloats over the fact that he can, and will, take advantage of it, and so, skips his chin on the next couple of shaves. Result (temporarily) is shown in Figure 2. His Schools Instructor (usually a very hard-bitten "Chief"), calls attention to the oversight; whereupon, young Mr. Boot, having developed tendencies of a "Sea Lawyer," quotes "A to N" . . . and preens himself on his smartness. But not for long. The Chief has a confidential conversation with the Schools' Officer, who thereupon quietly issues an order that all Group I students will be clean-shaved daily . . . and so they will, never fear. *Or else.*

Come now the rebellious ones, who so greatly admire

FIG.1. FIG.2. FIG.3. FIG.4. FIG.5. FIG.6. FIG.7.

If you're a smoker in bed a little suction cup ash tray of the type made for car dashboards will aid in keeping the barracks clean. Simply squoosh it to the side of your cot—and use it.

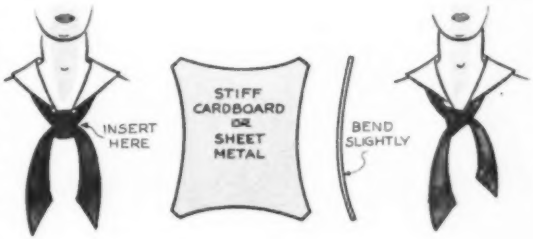
the "Handlebar Hanks" who have just come in from Sub. duty, and who get away with murder, while attending advanced classes in "Gyro Compass" and the like. How they envy those hirsute adornments which they, as "boots" may not yet possess! And how eagerly await they the gala day when they, too, may defy present authority, invoke that antediluvian and long overlooked passage in the "A to N," and fetch out for themselves a bit of facial foliage. Going aboard ship, he finds that he can, for the moment, "get away with murder" in this respect, so Mister Boot may shortly be expected to bloom forth in Fo'c'stle Sluggers, (Figure 3), Doctor Nutt, (Figure 4), or Skipper Nipper, (Figure 5). Or even the Webber & Field, (Figure 6). Just so long as he remembers that "—the beard and mustache, if worn, shall be neatly trimmed"—and so snips off the tip of a whisker or so now and then.

In all seriousness, Sailors, it's no doubt good fun to grow yourself a set of Spinach, for the edification of the little gal back home; particularly, if, the next time you hit the beach, you'd go to one of those trick photo parlors and have one made like this (Figure 7), so she can be sure to recognize you.

(N. B. Hey, Sailor—if you're running out of whisker styles which are not eccentric, and which may be worn "if neatly trimmed"—look up, in nearest public library, an old copy of Dickens' "David Copperfield." You'll be surprised—and delighted. Mr. Murdstone is particularly recommended.)

The Gob's Troublesome Neckerchief

Tying this useless but highly historical item of apparel in the regulation square knot (which isn't a square knot at all, but only looks square!) is a trick soon mastered by the naval recruit; but *keeping* it in that shape for as long as five minutes after starting on liberty is a trick that no one ever seems to learn. You start off with it neat and perfect, and by the time you're out the gate it has slipped into a lop-sided affair. The simple but effective remedy is a bit of heavy, hard cardboard (or preferably heavy sheet metal, if you can get it), cut as illustrated. Tie the knot carefully, and as nearly perfect as possible—slip the cardboard shield into the folds of the knot, and tack knot from the back with three or four invisible stitches of the silk thread you'll find in your sewing kit. Knot will hold its shape perfectly—and you may then slip the neckerchief on and off over your head many times before it must be taken apart for cleaning and pressing.



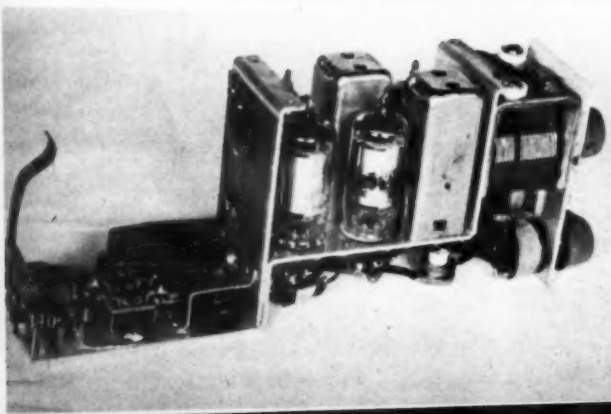
That Derned Alarm Clock

Soldier, Sailor, Marine . . . when your branch of service trusts you enough to send you out on "detached duty," you're on your own, in more ways than one. First in importance, is your being on the job, at any hour,

[*Continued on page 180*]

No experience is more annoying than to arrive at the shop only to discover that you have forgotten your identification badge and have to go all the way back for it. Avoid this by hanging your badge on the mirror before retiring, where you can't possibly miss it in the morning.

EMERGENCY AIR RAID RE



by Howard G. McEntee

THE tiny portable superhet receiver pictured here fills the need for a really small receiver which has very good sensitivity, yet is easy to tune. It was designed as a headphone set only, mainly because to add a speaker would practically double the size of the case.

This set is very handy for all sorts of portable work. One of the most obvious is illustrated here, where an air raid warden tunes in on the local broadcast station for reports on the emergency try-out. As we all know, in case of a real raid, the broadcast stations will immediately go off the air, to come on again only when the emergency is past. It is quite likely that these stations might be used to send out brief reports, coming on the air for only a few seconds at a time, in which case a warden with a portable pocket receiver could be kept informed of conditions or be given continuous orders while on duty.

The little set is obviously well fitted to all sorts of entertainment uses as well, such as by hikers, vacationists, boaters and others.

The parts used in this set were chosen with two factors in mind, efficiency and small size. Fortunately, it turned out that those selected are not overly expensive as is so often the case with very small

Top: An air warden uses the set to keep in touch with the situation after a hypothetical air raid in which power lines were destroyed. *Left:* Compact arrangement of chassis makes this powerful little superhet easy to tote. Vertical spring at back holds the batteries in place.

AIR RECEIVER

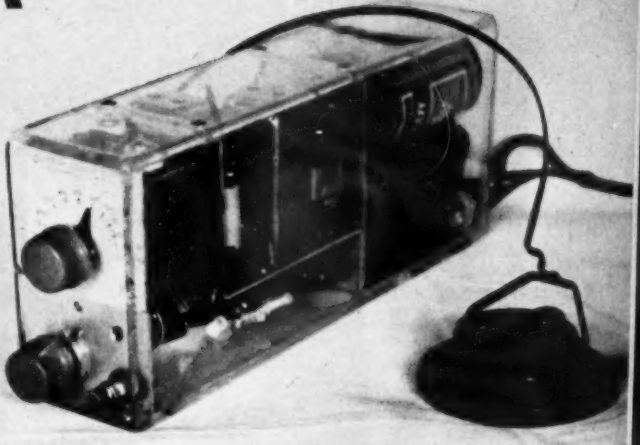
Air wardens, plane spotters, fire watchers and other defense workers will find this little radio invaluable.

components. As usual in a portable set, a compromise had to be reached between large batteries with their long life and high voltage, and the smallest, which would have reduced the size of the set considerably but at a great sacrifice in sensitivity and useful life.

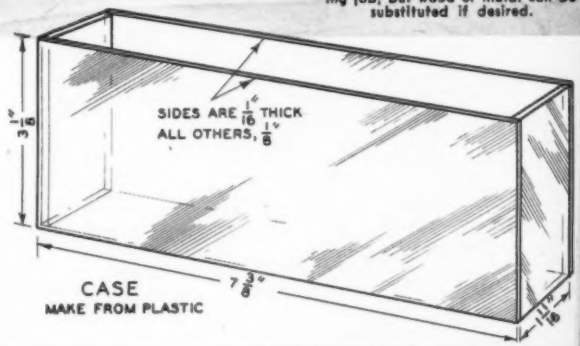
After considerable deliberation a 30-volt hearing aid battery of the smallest size was decided upon, together with a large standard flashlight cell. The latter is used up much faster than is the B battery and is a size available everywhere.

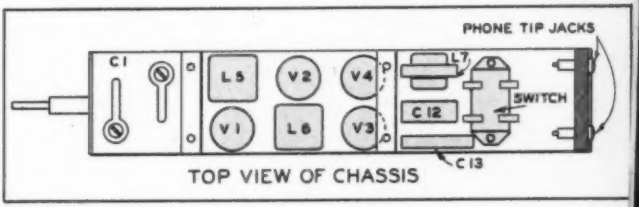
The B battery is made in a 19-volt size and this with a penlite cell would make the smallest and most compact power supply possible. Unfortunately, the sensitivity drops rapidly below 30 volts so that results would not be too satisfactory.

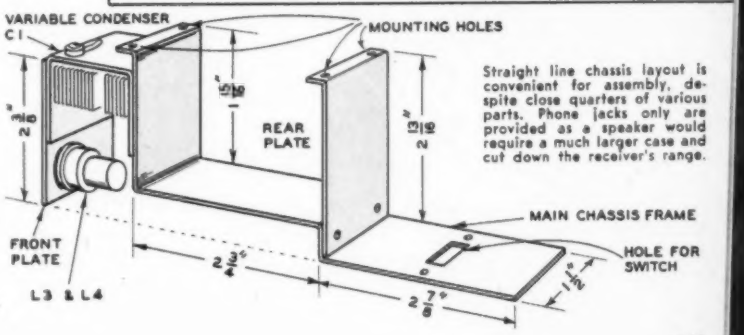
With the power supply indicated, the A cell has a life of from 6 to 8 hours use with the current drain of about 180 ma., and the B battery with its drain of 2.5 ma. should last from 50 to 60 hours. These figures are, of course, subject to large variations depending principally upon the continuous service the batteries are called upon to supply and the recuperation time allowed between periods of operation. The B battery has a very good shelf life, that is,



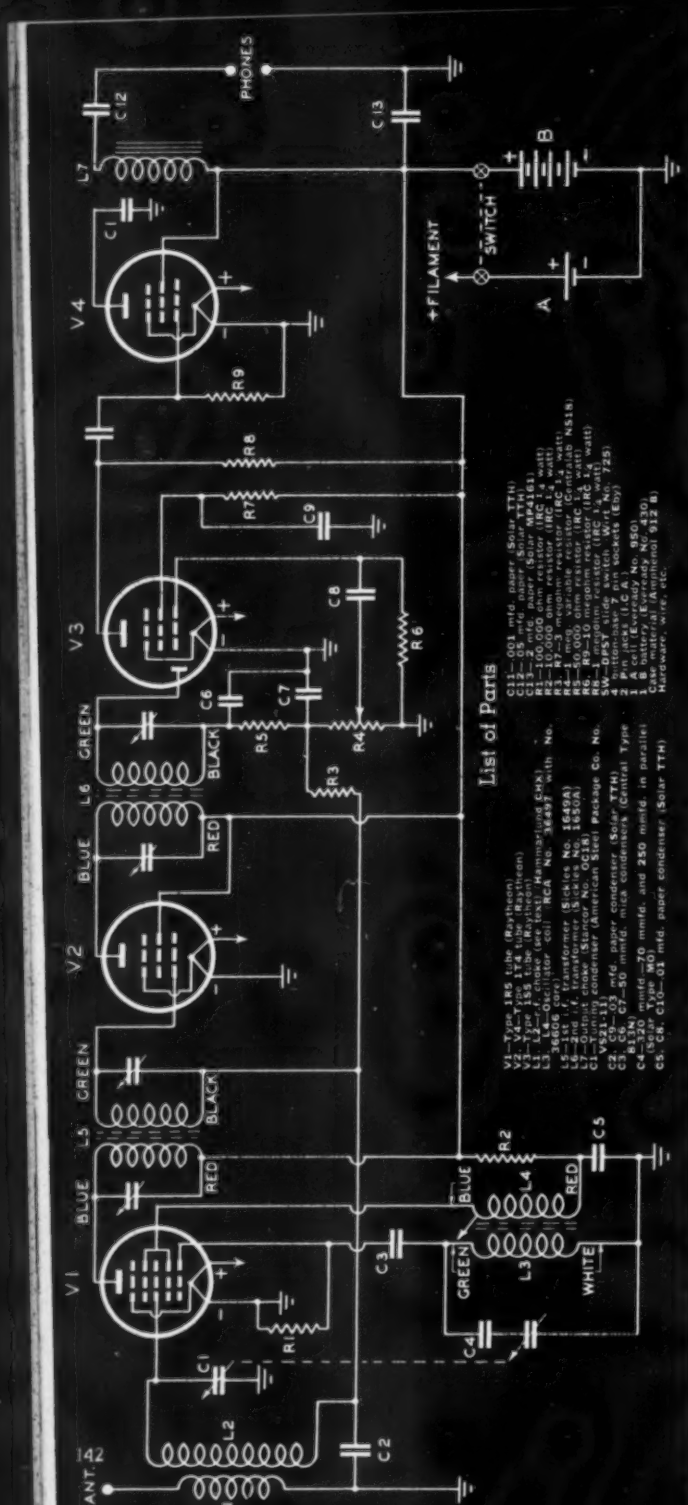
Plastic case makes a beautiful looking job, but wood or metal can be substituted if desired.







Straight line chassis layout is convenient for assembly, despite close quarters of various parts. Phone jacks only are provided as a speaker would require a much larger case and cut down the receiver's range.



ability to retain its usefulness over long periods of idleness. The A battery is, of course, also satisfactory in this respect.

The tubes are the popular button-base style used in most commercial "personal" receivers. There are four, the first three of which are used just as they are in standard practice, but the last, a 1T4, is employed as an output tube. In this position it affords good voltage gain which is quite satisfactory for headphone use, but it cannot put out much power for a loudspeaker. Its main feature is the reduction of both A and B drain afforded over the more widely used power tube which it replaces.

Aside from the unusual output tube, the circuit is quite conventional, and the unusual results obtained simply reflect the remarkable efficiency that can be had from these tiny components.

The set has no loop antenna, so it is necessary to use a short length of wire attached to the antenna post. The wire used with this set is of the very flexible variety with a spring clip on the end. In use, the clip is snapped onto anything metallic, or when in the open simply laid upon the ground. It would be possible to wind a loop on the case, but it would not be very efficient and would not afford the versatility of the clip lead.

The chassis of the receiver is made from a piece of sheet aluminum 1½" wide and $\frac{1}{16}$" thick in the manner shown in the drawing. To this main piece is added a rear plate of the same cross section, with the two held together by three 2/56 flat head screws.

The tiny two-gang vari-

Good sensitivity is provided by a 30-volt hearing aid battery plus a standard flashlight cell.

able condenser is held in place with three flat head screws and the third chassis piece, the front plate is fastened to the front plate of the condenser with two more of the same.

In a compact job of this sort very small screws are a necessity and the 2/56 variety is used almost exclusively, most of them being tapped into the chassis rather than used with nuts. The screws used on the variable condenser are of 6/32 size, since holes are already punched in the condenser frame and need only to be tapped.

All holes should, of course, be cut in the chassis before it is assembled or any of the parts are fastened to it. The $\frac{9}{16}$" diameter holes for the tubes are cut first, then those of smaller size.

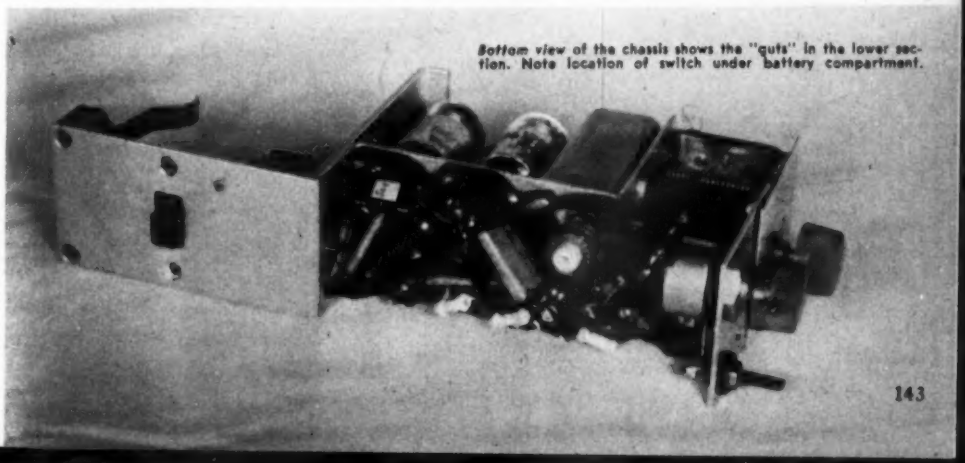
The i.f. transformers come with rather large spade lugs riveted on for mounting and these should be removed. In their place two small angles are soldered to each can and 2/56 screws employed for mounting. The small size screws are used to hold the tube sockets and the output choke, the latter fastened by means of a small metal strap.

A strip of insulation at the rear of the chassis holds two phone tip jacks and also the double spring that contacts the negative poles of the A and B batteries.

The positive sides of both batteries are connected through springs fastened to the rear chassis plate and insulated from it by fibre sheet and washers.

On the front piece is glued a cardboard dial with graduations from 0 to 100 printed in ink. To the rear of this piece is fastened the volume control and the oscillator coil, the latter mounted on a bracket so that it is about ¼" behind the metal and just clears the variable condenser plates as they revolve.

The case, which can be made of practically any material, is the next thing to consider. The one pictured here was made, somewhat as a novelty, from Amphenol 912B plastic. This material is easy to work, can be machined nicely and can be cemented together. The edge pieces, including the front and rear are of $\frac{1}{8}$" thick stock, $1\frac{9}{16}$" wide. They are cut to size and the corners trued carefully, then assembled on a sheet of plate glass by applying Amphenol 901 cement to the ends. Hold them tightly together with weights or clamps and be sure a true rectangle is formed by checking with a [*Continued on page* 152]

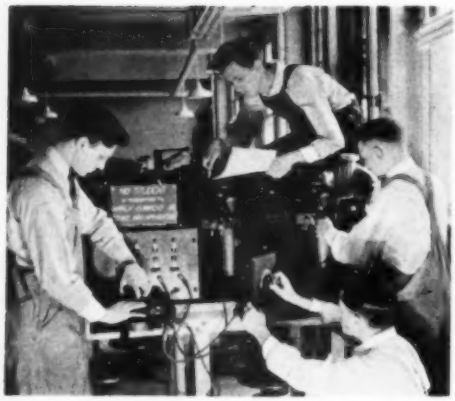


Bottom view of the chassis shows the "guts" in the lower section. Note location of switch under battery compartment.

THE SCHOOL SHOP

Conducted by Frank Petraglia,

Shop Instructor, Samuel Gompers Industrial High School
New York City



Learning electricity is an important part of any school shop's curriculum in time of war. Here are a group of students working on high tension equipment in a New York vocational school.

Experiments In Magic

TEST tubes in the amateur scientist's home laboratory are fraught with as many fascinating possibilities as are wood or metal working. A "lab" corner in your home workshop will yield a harvest of entertainment, scientific self-instruction, and good fun, too. However, since this is merely an introductory article, intended to show you what can be done experimentally with simple household articles, we will avoid mention of the more advanced types of experiments since they require special laboratory apparatus. Later, we hope to give you details for assembling a small, inexpensive "kit" which will launch you fully into the intriguing domains of practical science.

Here, for example, is a mystifying experiment with which you should be familiar. Scientifically, it demonstrates the power of atmospheric pressure, or the fact that the atmosphere of the earth maintains a constant, and considerable, pressure on everything about us. Human beings are under a pressure of about fifteen pounds per square inch; we do not feel this because this pressure is exerted uniformly on all sides. A moment's reflection will bring to mind countless examples of this phenomenon. An amusing example of atmospheric pressure at work may be demonstrated in this manner:

Fill a tumbler with water to the very brim and hold a postcard firmly over the top so that the water is completely covered. Now turn the tumbler upside down and—remove your hand from the postcard! Will the water spill over the floor? Will the postcard cling to the glass, preventing the water from spilling? The postcard stays in place as if cemented on. The explanation of this bit of topsy-turvy magic is that the water in the glass is not affected by atmospheric pressure but the card is, defying gravity and holding up the weight of the water.

Another instructive and amusing experi-

STUDENTS' PROBLEM BOX

1 Q. When there are no special tools on hand for joining ends of thin copper tubing, what emergency joining method may be used? —*W. L.*

A. The copper ends may be soldered. However, you must first flare the ends as much as possible, and then flange them to provide two faces. Butt the flanged ends of the two pieces together and solder, forming a raised ring of solder around the joint as reinforcement.

2 Q. Is it possible to devise some kind of "brush-support" for a glue-pot to prevent handles from becoming messy and glue-encrusted? —*B. B. N.*

A. One very simple method is to place a wooden ball so that it can roll snugly in the pot. The floating ball prevents the brush from sinking and also rolls to supply glue evenly to the bristles.

3 Q. Can you give me a formula for determining the area of a flat surface which has an irregular outline?—*G. B.*

A. Cut a cardboard the same size and shape as the irregular area, and also cut a square of known area. Weigh both pieces. The irregular area may now be found by dividing the weight of the template by the weight of the square, and then multiplying the result by the area of the square.

4 Q. Can you recommend a good book on electrical and radio mathematics?—*H. H.*

A. A very good book on the subject is "Mathematics For Electricians and Radiomen" by Lieut. Cook, USN. Published by McGraw Hill Company. Price $3.50.

ment can be performed with a quart bottle and some Seidlitz powders. When these articles are combined, and a cork placed into the bottle, the result is a "bottle cannon," and demonstrates the principle of explosive mixtures. Some chemical compounds react violently with one another in the presence of water and generate explosive gases.

Put a cup of water in a *strong* quart bottle and dissolve the powder contained in the blue Seidlitz packet in it. Next, roll up the contents of the white packet in a long roll, tied at both ends. Fasten this roll to the cork for the bottle with a piece of wire and put it inside the bottle as you insert the cork tightly. Now rest the bottle on its side and in a few minutes your cannon will be ready to fire. As the chemical reaction between the contents of the white and blue packets takes place in the water, gas is generated and soon reaches sufficient intensity to cause the cork [*Please turn to page* 152]

1- WHICH of these glues must be heated before use?

2- HOW are screws commonly sold, by the

POUND? $\frac{1}{2}$ DOZ.? GROSS?

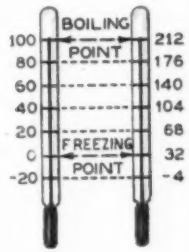
3- SOLDER is composed of tin and

LEAD? ZINC? COPPER?

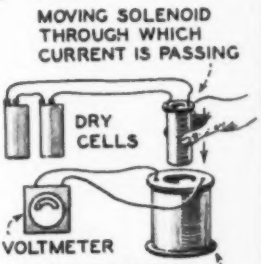
4- WHICH stain raises the grain of wood most?

OIL? WATER? ACID?

5- WHICH system is used in each of these thermometer scales?



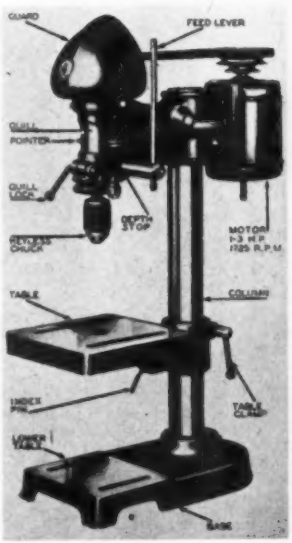
6- WHAT electrical laws could you demonstrate with this equipment?



HOW MANY OF THESE QUESTIONS CAN YOU ANSWER? If you get four out of six right you're better than average. Turn to page 176 for answers.

MI SHOP SCRAPBOOK INFORMATION SHEET

The Drill Press



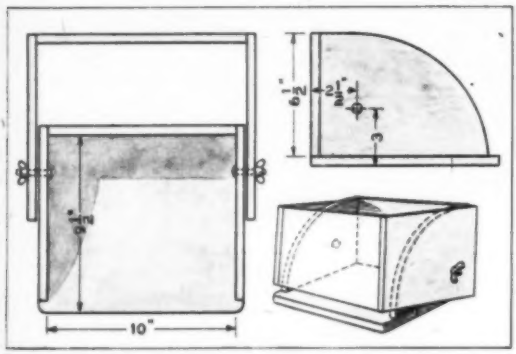
PROBABLY the most universal tool in the average home workshop is the drill press. The number of operations that may be performed with this versatile tool is almost unlimited, and if used in connection with a circular saw (described in a previous Information Sheet), will come as close to providing a complete two-tool workshop as it is possible to get.

Basically, the drill press is a vertical, power-driven spindle equipped to take chucks and other tool holding equipment. The motor is generally attached in back of the "head," the latter sliding up and down the column and locked in place wherever needed by a hand lever. The table is also adjustable for height. Pulleys on the head and on the motor give the drill press an average speed range of 590 to 5,000 revolutions per minute, the slower speeds being used in drilling and metal working, and the higher speeds for such operations as routing, milling, etc., particularly in wood.

The better drill presses are provided with tapered shanks to take a Jacobs chuck, and are equipped with ball bearings. Both metal drills and wood bits may be used in the drill press, as well as various specialized bits such as expensive bits, countersink bits, etc.

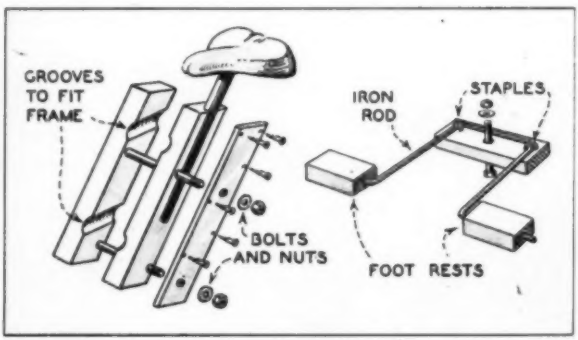
For woodworking, mortising can be done with the use of a hollow chisel mortise attachment which cuts clean, square mortises. Fancy inlay work may be done with the aid of router bits of different types and sizes. A few of the other operations which a drill press may perform are: sanding, shaping, fluting, carving, surfacing, cutting and fitting plugs, and tenoning. As far as we know, nobody has ever tried sawing with a drill press by attaching a circular saw blade to the spindle, but we have little doubt that it would be accomplished by some determined and ingenious home workshopper.

Drill presses are moderate in cost and a very good one may be obtained for as low as $45.



Groceries And Gertrude Ride On The Rear

WHETHER you're going to the store for the groceries or taking the youngster out for some fresh air, this convertible rear seat does the trick. Use ½" or ¾" stock of the dimensions shown. Nails or screws are used for fastening, the latter being stronger—and safer if the box is used as a seat. Paint the finished job to match the bike.—*D. J. M.*

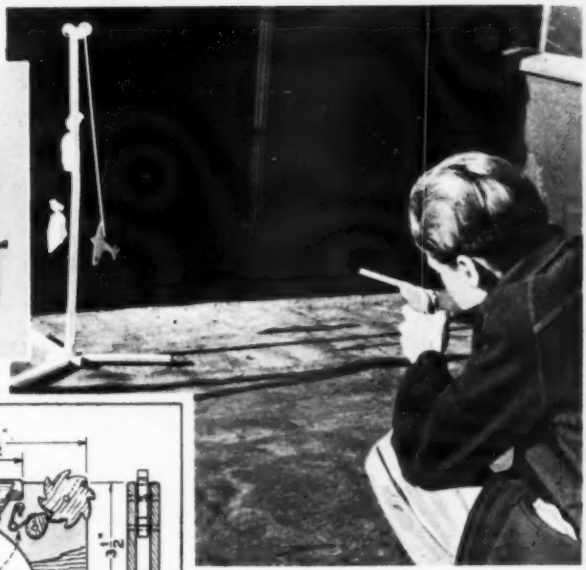


A Seat By The Bar —For Junior

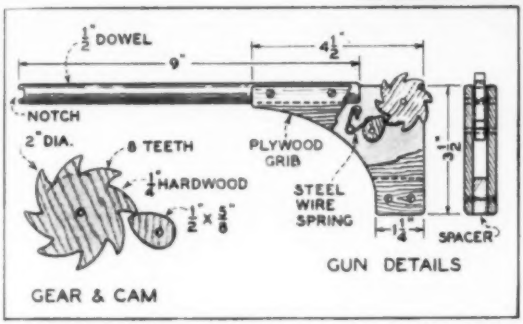
IF YOU'D rather keep an eye on little Jimmie during his passenger rides on the bike, this seat is the answer. Built from scrap lumber about 1¼" thick, and an old tricycle seat, the seat is sturdy and inexpensive. It may be adjusted for height also. The foot rest rod can be an old curtain rod, if you have a heavy one.

Mechanix Illustrated

Paratroop Trapshooter

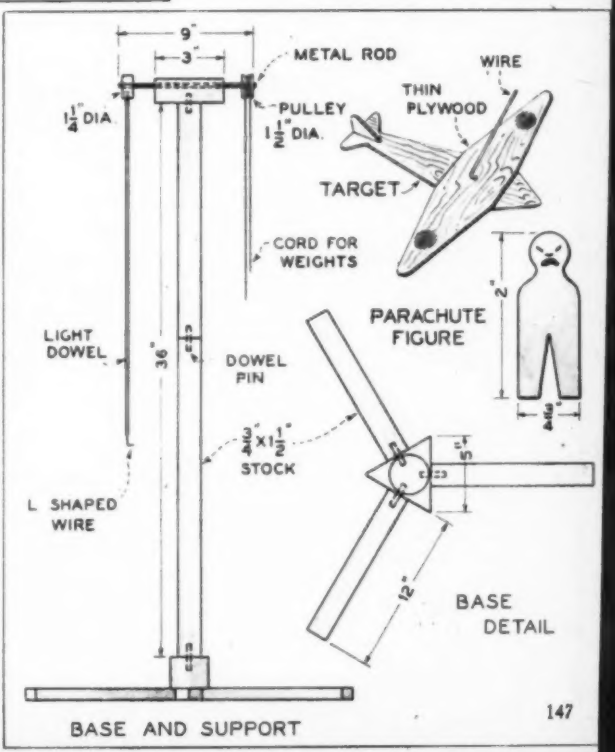


Gravity power turns the target arm of this fascinating game. Little bags of sand of different weights provide the pull on the gravity motor. When the plane is hit by rubber band from gun, it falls.

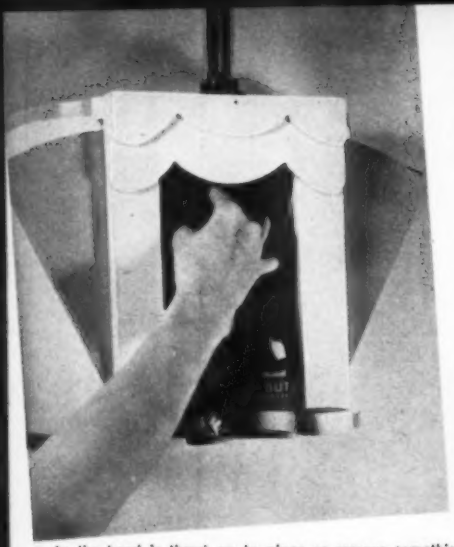


THIS unique target game may be constructed from various pieces of wood scrap. The only tools necessary beside the usual saw, screw driver, and hammer is a coping saw or jig saw.

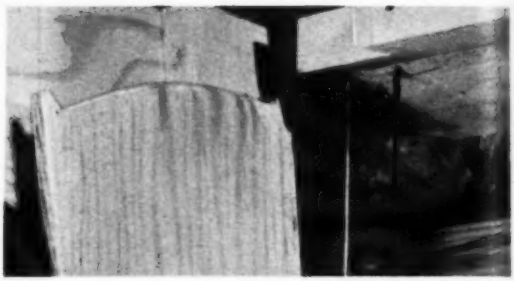
The gun provides for eight shots set off in rapid succession. The ammunition used is rubber bands. For the barrel of the gun use a nine inch length of ½" dowel. The forward end of this piece must have a very smooth notch about a quarter of an inch deep. Cut the sides to the shape shown in the drawing. Plywood answers this purpose admirably. The most difficult part of the gun is the gear and the cam. The dimensions for both are shown in the drawing. These should be cut from hard wood. They are each ¼" in thickness. The cam is mounted so that it will catch the teeth of the gear. A piece of spring steel piano wire causes the cam to return to position and [*Continued on page* 151]



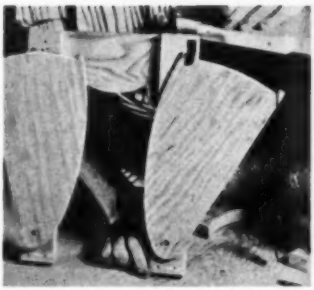
STAGE-STRUCK KITCHEN CABINET



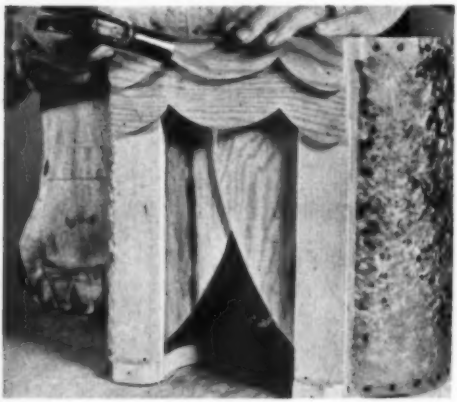
As the hand is thrust up to place or remove something the curtains pivot open, returning to place as the hand drops. *Below:* Trial assembly; do not fix front until all painting is dry.



Above: Front swung out showing how curtains counterbalance.



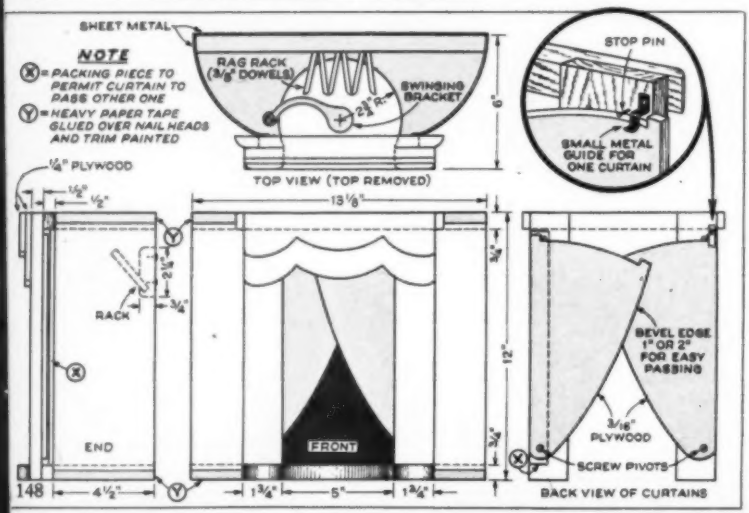
Right: View showing back of stage front. Note how curtains are cut to form their own stop points.



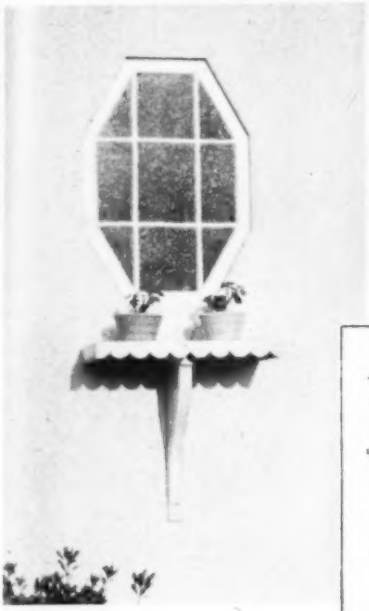
THIS novel little sink cabinet, painted in dainty colors, adds a charming touch to the kitchen. Designed to simulate a miniature stage, complete even to a small figure, which may be swung out of the way; it will be welcomed by the ladies, not only as a novelty, but also for its usefulness.

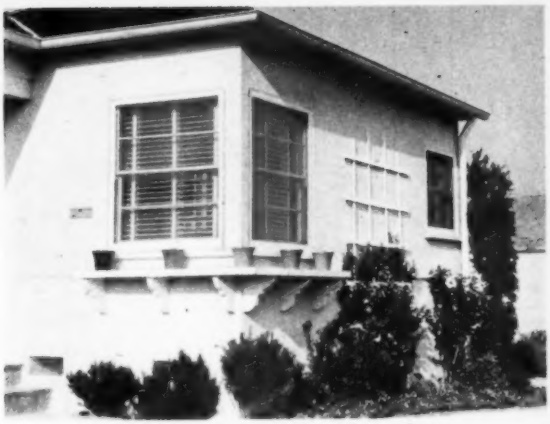
The body of the stage is made from ¾" stock and light sheet metal, the bottom member having a circular portion removed which permits the hand to be brought up parting the counterbalanced curtains. The curtain front should not be permanently attached till all painting is

[*Continued on page* 151]



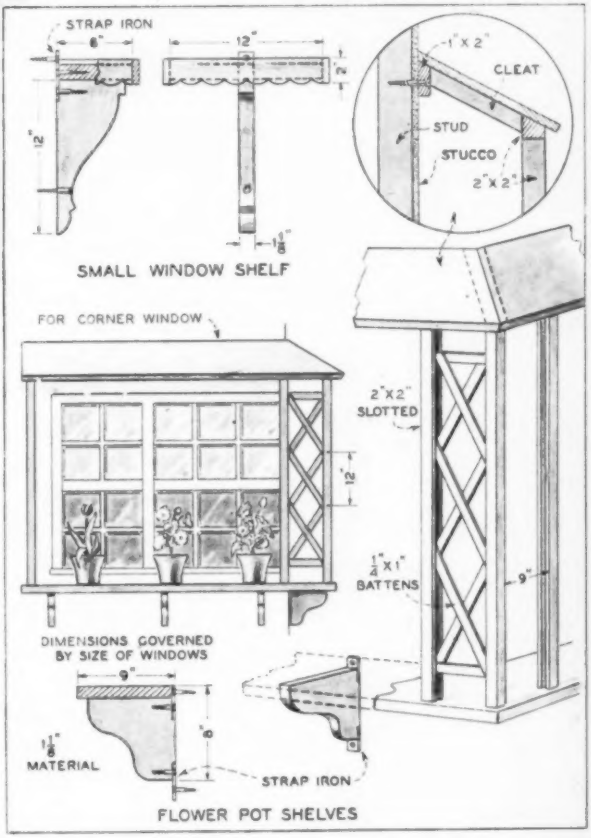
Flower-Pot Shelves





Above: A simple but effective treatment of a corner window. *Left:* Shelf like this smartens the small, isolated window.

IN YOUR wartime program of maintenance and repairs a flower-pot shelf under a window is a worth-while project. The small shelf is especially effective with a small, isolated window. For corner windows, either the plain shelf or one with trellis will greatly improve the appearance. It is important to screw the brackets through the stucco or siding to studs, and these can be located either by tapping lightly with a hammer or drilling small test holes. In standard practice studding is spaced 16-in. apart on centers. Small flat iron strips are screwed to the shelf brackets as shown, and these in turn screwed to the wall. A trellis is made with slotted two-by-two's and the lattice lapped in them. For a roof, use ¾-in. pine or other wood.—*Hi Sibley.*



Drawing above gives construction suggestions for several types of shelves.

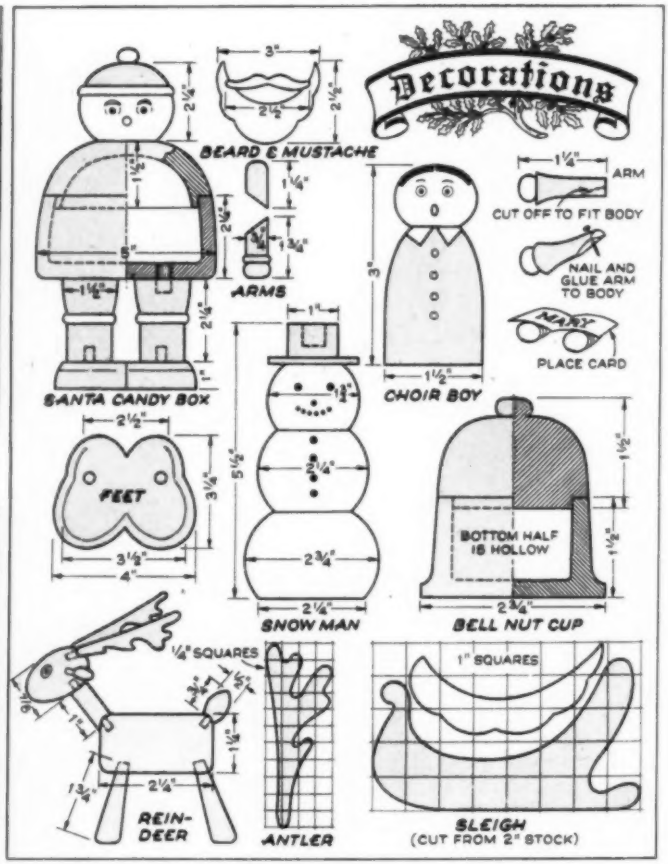
Above: Streamlined reindeer pull Santa's sled. *Right:* Bell nut cup is finished in gilt.

Decorations from the Workshop

HOLIDAY decorations take on a new dress when turned out by the home crafter in his shop. Wood lathe and jig saw are the two power tools used in producing this interesting group.

Common white pine was used for all of the pieces, with a few scraps of plywood for Santa's whiskers and the sleigh decoration. The paint job, of course, adds a great deal to the character of the [*Continued on next page*]

Above: Bit the snowman, with candlestick in hat. *Below:* Santa Claus comes apart in the middle.



Decorations From Workshop

[*Continued from preceding page*]

various pieces, and care should be taken with this phase of the work. Two coats of enamel are necessary for a glossy finish. The first coat is an all over white, to speed up the process. The different colors are applied as the second coat of enamel.

Dimensions given need not be rigidly followed, though the approximate proportion should be maintained. The size may be increased or diminished to suit the space that each of the decorations is to occupy.—*Elma Waltner.*

Paratroop Trapshooter

[*Continued from page* 147]

hold the gear from sliding. The tension of the rubber bands will hold the gear when the gun is loaded.

The gear is mounted so that the teeth protrude over the edge of the top and the back.

A piece of wood ⅝" thick is attached to the bottom part of the handle as a spacer. The dowel used as a barrel is shaved down on the sides to the same thickness thereby providing a spacer at the top part of the sides of the handle, and consequently a recess for the gear and the cam.

To load the gun loop one end of the rubber band over the front end of the barrel, draw it back and place it on one of the teeth of the gear. Then force the gear backward with the thumb. The gear will be held by the cam. This is repeated until the gun is fully loaded. To release the bends it is necessary only to move the gear forward with the thumb. This can be done very rapidly.

The stand for the target consists of a triangular stand supporting an upright. At the top of this is a pulley on one end of a shaft and a circular piece at the other end. A length of light dowel holds the target at the end where there is an L shaped hook directed inward. When the plane is hit it will naturally slide off the L hook. The centrifugal force of the arm whirling around will keep the plane on the hook until it is hit.

A novel form of power whirls the arm around. Two small bags, one heavier than the other each filled with sand provide a means of turning the arm. The ends of a piece of string are attached to one of the small sand bags. The string is looped over the end of the pulley mentioned above. The weight of the heavier bag moving downward will cause the arm to turn. The lighter bag maintains the tension of the string.

The entire target stand is dowelled together so that it may be taken apart easily.

Another novel and interesting target is a small parachute jumper. The parachute is made of paper used to cover model airplanes. A circular piece of this paper is cut in a circle of about twelve inches diameter. Four pieces of string attached to four opposing sides and thence to a small wooden figure completes the parachute.

Republic Thunderbolt

[*Continued from page* 115]

Aside from that, the only thing to worry about is the secure mounting of the control plate. We take care of this by using ⅛" sheet balsa, filling in the bottom of the wing, all around the area where the control plate is mounted. A bolt is mounted where W-5 and W-13 intersect, and it is this bolt that holds the control plate. The control plate should fit a bit loose, enough to swivel freely. A .040" steel wire is run through the wing, being hinged to the small extension on the control plate and to the elevator horn. The two control lines (either .012" music wire or strong fish-line) run out from the control plate to a handle which is held by the operator. A pull on the front of the handle puts the front control line under tension, twisting the control plate and applying "up" elevator, causing the model to climb. A pull on the rear of the handle causes a dive.

Stage-Struck Kitchen Cabinet

[*Continued from page* 148]

complete and dry. As will be noted in the drawing the curtain pieces are so cut as to leave small stop projections which permit the curtain to open and close just the right amount. A brad will serve for the actual stop. When counterbalancing the curtain use a firm smooth cord which will slip through the small hook (in under side of top), which forms the "pulley," easily.

"This one tells you how long to cook a three-minute egg!"

Emergency Air Raid Receiver

[*Continued from page* 143]

square. This is the only ticklish part of making the case and it must be done neatly if the full effect of the clear plastic is to be had.

When the rectangle is dry, smooth off and square the edges by rubbing over a sheet of fine sandpaper held on a glass plate, using a rotary motion to assure that all surfaces are even.

The two sides are of 1/16" stock, and one is glued in place while the other is held on with tiny screws. Fasten the one side in place and allow all joints to dry well before starting on the other.

The final side is held by 0/80 fillister head screws ¼" long, which are obtainable from most model shops, as is the tap used to prepare the threads for these screws. A No. 57 drill is used for the threads, while the side has No. 50 drill holes to clear the shanks of the screws. When drilling this material, especially with the very small drills, the drill should be withdrawn from the hole every few seconds to prevent overheating and to clear out the chips. To allow the heads of the screws to sink below the surface of the material, the clearance holes are opened up part way through with a No. 39 drill.

When the case has been assembled, all edges and corners are smoothed off with very fine sandpaper, and given a final rub with powdered pumice and water. If carefully done, the result is a case that looks as though it were cut out of solid glass, and is indeed an object of beauty.

The next task is wiring up, and here great caution must be exercised, since the parts are so tiny that excessive heat from the soldering iron will quickly ruin them. The iron tip should be filed to a long slim point before use and the iron should be held on the tiny parts just long enough to flow the solder. This is especially true of the high values of carbon resistors which tend to become noisy if "cooked" too long.

The tube socket terminals should be snipped off about ⅛" from the bakelite; this saves space and still allows adequate soldering area.

The small parts are fastened in place from point to point using care to keep leads short and direct. All the resistors and condensers are held only by their leads. Wire in the filament circuit first, then the leads from the i.f. transformer, then the remaining parts in any desired order.

The antenna coil, L1 and L2, is made from a five-section r.f. choke; one section is used for the primary and one for the secondary. The ceramic tube can be broken off behind the second section and the coils mounted below the chassis under L5 by soldering the metal end cap to a screw head.

Use is made at several points in the set of tiny "lug strips" made from strips of fibre with eyelets clinched into holes drilled in the strip. The strips are about 1/16"x3/16" in cross section, and of length depending upon the number of tie points required.

After a thorough wiring check, the set is ready for final electrical lineup. This is started by adjustment of the i.f. transformers to 465 kc. in the usual manner. These transformers come prealigned roughly to the correct frequency, so that it is usually sufficient to feed the i.f. signal from a generator into the grid circuit of VI. All the four trimmers tune quite sharply; if one does not, trouble should be suspected.

In all the alignment procedure the signal input should be kept as low as possible so the a.v.c. does not come into action. An output meter of some sort is a great help, although it is possible to align the set roughly by ear.

When making the r.f. alignment, extremely loose coupling to the signal generator must be used. It is best to connect a lead from the ground post of the generator to the set chassis and to run a lead from the "hot" generator post to the set antenna post; simply wrapping the insulated wire around the latter with no direct connection.

The r.f. alignment is accomplished in the usual manner. The receiver should tune a range from about 560 to 1500 kc. and should be aligned at 650 and 1400 kc. The iron core of the oscillator coil L3, L4 should be turned in until only ⅛" of the screw is left out. Then adjust the trimmer on the smaller section of the variable condenser (the oscillator section) until the desired frequency range can be covered. Next, align the antenna section by setting the trimmer at the high frequency end of the scale and touching up the oscillator core at the low end.

The set is now complete and ready for many hours of use. It should weigh about 23 ounces complete with batteries. A small, light head-set, or a hearing aid phone which fits into the ear is the final touch.

Experiments In Magic

[*Continued from page* 145]

to pop right out of the bottle! Of course, caution should be exercised in practicing this experiment.

Winter weather offers a chance to make an interesting experiment in heat conduction. As you know, certain colors absorb heat more readily than others. Well, at least, you can prove this by cutting, let us say, five squares from similar grain paper of five different colors. Black, red, light blue, white and yellow are a good combination. Place these squares on a level patch of snow in the sunlight an hour. What will happen?

You will find that the differing heat-absorbing qualities of the colored papers have sunk to different levels by melting the snow. The lowest one will be the black square. Red will not thaw as much snow as the black. Yellow is close to red in effect, while the light blue will sink hardly at all and the white scarcely budges.

Your Wartime Car

by Frederick C. Russell

If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope for a personal reply to your letter.

I can get a good used truck filter. Would this be satisfactory on my car? E. H. N.

If there is room to attach it, go ahead. The main caution in installing filters is to avoid using one too small for the engine.

Try it!

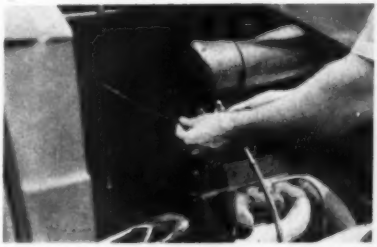
If you're puzzled to know which is the positive post of a battery just cut a potato in half and insert the ends of two wires from the battery terminals. There will be a green stain on the potato around the positive wire. Keep the wires about an inch apart.

When testing compression with a gauge should the throttle be open or closed? T. S. G. Open the throttle wide. Have the engine well warmed up.

Gas mileage has been much too low, considering that I keep the car in good condition and do not drive fast. B. L. R.

On your job the hand choke control shaft is apt to stick in the flexible casing. As choke valve is always partially closed, mixture is too rich. The kink is near the carburetor.

I distinctly feel a bumping in the clutch pedal when pressing my foot on it. What's wrong? T. J. There have been several cases of this recently. May be bad alignment with the transmission. Be sure the clutch pedal pull-back spring isn't broken.

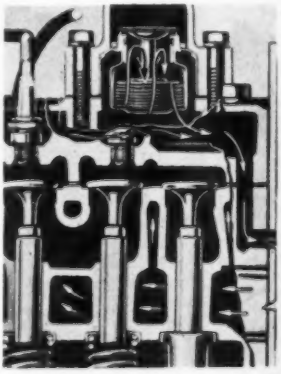


I have been having a lot of trouble with the automatic overdrive on my car. Shifting does not occur until I have driven considerably above the speed at which the gears ordinarily go into fourth. B. G. H. Either the idling speed is too fast, or there is binding in the accelerator or throttle controls. Idling speed should be 450 r. p. m.

When bleeding hydraulic lines is it necessary to keep the supply tank filled? R. E. S.

It should be half filled throughout the job, otherwise air will enter the system and spoil the job.

I have been checking the electrical system for line losses. What is the allowable limit in the ground strap? N. R. O. The loss should not exceed 2 volt.



Why doesn't a motor thermostat cause a water pressure build-up and force water to leak out when the valve is closed and the engine is cold? K. W. F.

It merely by-passes the water as per arrows at right.

Are breaker points in the primary or secondary ignition circuit? J. L. They are in the primary, making and breaking the primary circuit through the coil.

I've had a lot of trouble with the engine holding back, as if not getting enough gas, when climbing long, steep hills. Replacing the fuel pump hasn't helped. S. L. L. This looks like a case of too little valve tappet clearance. Some of the valves are holding open when the engine heats above normal.

Irish Spinning Wheel

[*Continued from page* 137]

curve and hammer flat. Drill two holes in one end and chop out the web with a narrow cold chisel, finishing with a file. Also file a tenon on the axle to fit this mortise, and rivet it in. The crank pin is made from a hinge pin or ball end of a small curtain rod. Grip a piece of the pin in a lathe or drill press chuck and file a shoulder on it as it turns, forming a pin to enter a hole in the free end of the crank. Rivet the pin in place.

In the original wheel hooks in the flier were pieces of wire driven in and bent back, but small screw hooks make good substitutes.

The needle is made by flattening the rod near one end and drilling a small hole there. Heat this eye red hot and drive in a punch to spread it. Hold the other end in a lathe drill chuck and file the screw section down, afterward making the point and cutting it off. Cut the thread with any easily obtainable die. Bore the blunt end of the needle into the eye and round off corners. Press the flier against the eye and drill a small hole through the neck and needle to take a brad for a key.

Bore the bobbin from both ends and slip it over the needle. It should turn freely. Thread the flier wharve, or set a nut into one end. A piece of ⅛" chalk line makes a good belt. Raise the flier until the nut is below center, pass the belt under the flier wharve, over the wheel, under the bobbin wharve, and over the wheel again, and unravel the ends for an inch for sewing smoothly together.

Make the pedal and hinge it with a flattened bolt dadoed into the upper surface and covered with a heel plate of heavy sheet iron nailed on; or have a blacksmith make the hinge in one piece, with the pivots offset downward. Staples driven into the stretcher over the pins hinge the pedal. Turn a ½" screw hook into the ends of the pitman, and close the upper one around the crank pin. Tie the lower one to the treadle with a strip of leather.

Don't Hide House Number!

[*Continued from page* 127]

Figs. 9 and 11 are simplest of all, care being taken in the selection of the white-painted rock for a flat surface on one side, and buried at least a third of the way in the ground. Bizarre numerals, as in Fig. 10, are attention getters but should not be too extreme to be read. These are cut from ¾-in. wood and secured to a board with white background. A steel plate, dark ground with white numerals studded with ruby reflectors is visible a long way day or night, as in Fig. 12.

A beach resident has achieved a happy effect with the cork buoy shown in one of the photos.

Oriental lacquer dries only when wet.

Build A Wood Turning Lathe

[*Continued from page* 121]

extending along the bed, and square it up. Mark where the holes are to be drilled, remove the unit, and drill four ¼" holes through the steel plate and bed irons. Bolt the head stock down tightly. 1½" from the working end of the spindle, attach a ⅝" collar. Slide a ⅝" thrust bearing on from the opposite end, and slip the spindle through the bearings. Add the drive pulley, and the head stock is finished.

Now move down the other end. Put the tail stock slide on the bed, and put on the clip, but do not tighten it up. Set the tail stock on the slide, and push the whole thing up to the live spindle. Does it line up? Probably not, which is just the reason why we didn't bolt it down sooner. If it is perfect, you can go ahead and bolt it down, after you have lined it up true. If it doesn't, put it in the vise, and raise or lower it as may be the case, by turning the T. Do this until it lines up perfectly before bolting it down.

If you wish, a welding torch, used at the joints, will make an absolutely rigid job.

Centers can be purchased, or you can make your own. A work arbor is very handy on the lathe and can be bought reasonably. Since the live spindle extends out for several inches outboard turning can be done, or any number of attachments added.

Directions for the tool rest are not given, as you can buy one ready made for less than a dollar.

"Hey, buddy, how about a light?"

Deep-cut "Ballard" rifling was first introduced in 1875 by Marlin in a single shot rifle. The superiority of this new type rifling was so marked that Marlin's 1875 model soon became recognized as the world's outstanding target arm.

For many years, Marlin rifles have featured Ballard type rifling for accuracy and long life. Before shipment, all Marlin rifles have been thoroughly tested and targeted.

Marlin recently introduced a new chemical treatment for barrel bores which resists rust and corrosion. This new improvement adds to the long life and trouble-free use of Marlin rifles.

Since early in 1942, engaged solely in war production.

These famous Marlin features are worth remembering after the war is won.

1870 ★ THE MARLIN FIREARMS CO. NEW HAVEN, CONN., U. S. A. ★ 1942

We Kept The Tigers Flying

[*Continued from page* 38]

There were no casualties. We had learned one thing, however. Those Japs can really shoot!

When we were passing them, we were going at the rate of five hundred miles an hour. They were doing two hundred and fifty, coming from the opposite direction. That makes a total speed of seven hundred and fifty miles an hour. It takes real shooting to hit anything at that speed.

One reason we were able to get so many hits lay in the fact we had so many guns going at one time. With our technique of ships diving in pairs, that means twelve guns going at once, or a concentration of some 200 bullets in a split second. Combine that with surprise and the fact we had height from which to pounce and you can understand why we were able to get a slug in now and then. And it usually takes only one bullet, if you hit right.

I noticed another thing during this first fight. None of those Jap Bomber flyers used parachutes. Later I learned that only the fighter pilots bother to carry them and they almost never use them. I never did learn why. Except perhaps it is because of their policy never to surrender. I only saw one Nip flyer who was a prisoner, all the time I was with the A.V.G.

I remember one incident, which will always stand out in my mind.

A Jap pilot of a fighting plane leaped when his ship started burning. As he neared the ground, he opened his chute and then started firing at a group of Chinese on the ground with his tommy gun. He got thirty of them, too, before they managed to riddle him. I learned one thing about the little yellow bellies: they are no sissies. They're in there to win and they'll keep right on fighting up until the bitter end.

It was our first real fight and I felt pretty good on the way back. Felt good, that is, until I suddenly looked around and found myself alone in the sky. I'd managed to become separated from the rest of the squadron.

It sounds silly, but later I learned that the easiest thing in the world is to get lost after a dog fight. I was pretty lonely and worried for a few minutes, because I knew my gas was getting very low. But I used my compass and my instincts, and after a bit I picked up the curving trail of the Burma Road. I got in all right.

When word went to Chungking of the results of this raid, we received personal congratulations from the Gissimo.

We had tasted blood and we were anxious for more. But before I was next to see action, orders transferred the Third Pursuit Squadron to Rangoon.

The Japs had a real present for Rangoon that Christmas morning. They sent over fifty-four Mitsubishis, escorted by eighteen fighters. Against these we were able to put up sixteen P-40's. We made history that day!

We had only two advantages. The marvelous warning net set up by Chennault gave us sufficient warning to enable us to get our ships warmed up and into the air. The flight spiralled to 20,000 feet, using oxygen, and were all set for them when they came. They weren't looking for it.

The second break was the Japs' fear of cumulus clouds. Always there were these heavy clouds over Burma and the Nips seemed invariably to fight shy of them. They wouldn't fight in them and often refused to dive into them to take refuge.

We were up in the clouds, well concealed and watching for the enemy through holes, when they showed up. We were, as usual, in pairs, so as not to get in each other's way. Alternate pairs were assigned to bombers and to fighters.

It came at last from Operations: "Okay, Boys, they're over Boston!" Boston was code for Rangoon that day.

And then we peeled off. I guess all the boys felt the same when they saw that Jap formation below. Hopelessly outnumbered! But there was no stopping. Each wingman stuck like glue to his flight leader's tail as he zoomed down at five hundred miles an hour, engines wide and screaming. And then the sudden yam-yam of machine guns and the tracer bullets like wild fireflies. We hit them like a thunderbolt.

[*Continued on page* 172]

A New World Is Coming

[*Continued from page* 69]

My answer is that now, today, the pressures of this war are compressing into the space of months developments that might have taken us a half century to realize if necessity had not forced the pace.

Those pressures are unprecedented. The developments are unprecedented. Give us a victorious peace and the freedom of enterprise it should guarantee, and our progress will be unprecedented!

One does not need to venture into prophecy to sketch the bold lines of what that progress can be. They have already been traced. Already our world of 1940, in which we took such pardonable if mistaken pride, is so distant in the past that it has become an antiquity, as seen through scientific eyes. The inconceivables of two years ago are today's realities.

More than a century was consumed in bringing the crude rubber production of the world up to a million tons yearly. The United States alone is now undertaking to accomplish almost as mighty a feat in less than two years, by the manufacture of chemical rubbers from petroleum, alcohol, and coal and limestone.

By the end of 1943, our production of aluminum will be at a rate almost seven times greater than was attained in 1939, after fifty years of intensive development. And we will be recovering from brine, sea water, and other sources approximately 100 times the amount of magnesium that was produced in 1939, when the magnesium industry in America was 24 years old.

Our aviation industry is establishing facilities for the manufacture in one year of almost double the number of planes it produced throughout the 37 years of its history beginning with the Wright brothers at Kitty Hawk and culminating in the Defense Program. Meanwhile, largely as a result of chemical advances in fuels, plastics and light metals, aircraft engineers are designing trans-oceanic planes capable of flying to Europe and back non-stop, carrying payloads of 20 tons. The projected planes are quadruple the size of the famous "Clipper" planes that pioneered in inaugurating trans-Atlantic commercial air service.

The nation will emerge from this war with capacities for making plastics, synthetic fibers, nitrates, hydrocarbons, high octane gasolines and literally scores of chemical and other raw materials on a scale that only two years ago was beyond our comprehension. The changes that have taken place in our thinking and planning approach the unbelievable when one detaches himself from the present long enough to regain the viewpoint of only the recent past. The first proposal that we build 50,000 war planes left us incredulous. We asked how could we maintain such a vast fleet even should it be built, or train the men to fly it. Now, the demand for 125,000 war planes in a single year is met with the answer, "Give us the materials and we'll give you the planes, as ordered."

In terms of dollars, the hundreds of millions of that by-gone economy stemming from the First World War have suddenly become tens of billions! A million dollars is hardly pin-money in our planning!

Few of us, even among scientists, grasp the technical implications of these enormous projects which are becoming facts with emergency speed. The aluminum-producing capacity being created

will furnish in one year metal enough to build thrice the number of passenger cars now operating on all American railroads. To produce this aluminum will require more electricity annually than was consumed in 1940 in 27 of our 48 states. Despite wartime tax schedules and wages, aluminum ingots now cost 25 per cent less than in 1940, and further economies are forecast through savings in fabricating costs. Aluminum has become a major metal.

Magnesium is about 60 per cent the weight of aluminum and about one-fifth the weight of steel. It sold, in 1915, for $5.00 per pound and until a few years ago was a structural curiosity. Today, measured by cubic feet, magnesium at 22½ cents a pound is cheaper than aluminum selling at 15 cents a pound, and almost a half ton of it, on the average, is going into every American fighting plane that is built. After the war, the nation's capacity for producing this lightest of all structural metals will be more than double its aluminum output of 1939.

Equally significant is the source of most of the magnesium now employed industrially. For the first time in the history of the world a structural metal is being obtained from the sea by a chemical process. Huge pumps force 300,000,000 gallons of sea water daily through intricate apparatus. At present, magnesium and bromine are the only products precipitated, but potentially the water contains traces of every element found on land. Are we opening a new field of chemistry, far more bizarre than any of the imaginings of fictionists? Nobody knows as yet.

In turn, steel is challenging the light metals. Low alloy steels and new modifications of the higher alloy steels, fresh from the laboratory, are bidding for expanding uses in aviation and wherever lightness and strength are requisites. In the steel industry today, technicians speak confidently of monster aircraft that will be largely steel. These new alloys are three times the weight of aluminum and almost five times the weight of magnesium, but their tensile strength approximates 190,000 pounds to the square inch. This advantage permits weight to be shed by reducing bulk and eliminating needless supports.

The larger planes grow in the future, say the chemists of steel, the more pronounced will be the trend to the new steel alloys. Less subject to corrosion than plain steel, they are more easily corroded than aluminum, but this problem in protection is said to be on the way to early solution. So watch steel in the mounting competition of light metals.

By all means, too, watch petroleum. Some years ago it was believed that the ultimate in motor fuel would be reached by the creation of a gasoline equivalent in power and anti-knock qualities to pure iso-octane. So superior was iso-octane in these respects that it arbitrarily was given an octane number of 100, which became the standard in evaluating all gasolines. But that was before

[*Continued on page* 158]

HARLEY-DAVIDSON

Economy AIDS THE NATION'S VICTORY PROGRAM

Thousands of riders have enlisted their Harley-Davidson Motorcycles for duty on the home front. Many are riding in the service of Civilian Defense. Others are motorcycling to and from their war jobs, eliminating additional burden on overcrowded buses and streetcars. And because Harley-Davidsons use so little gas and oil, they conserve these vital war needs—and rubber, too!

While there are no new Harley-Davidsons available now for civilian use, your dealer may have some good values in reconditioned models. *See him today.*

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the battle of Britain, and things were to be learned.

The epic fight of the Royal Air Force to save England, raging month upon month against odds, was also a chemists' fight to produce better fuels—fuels that would get planes into the air in a fraction of the former time, that would give greater and yet greater speeds, longer and yet longer ranges. The American chemist was in that fight because he knew more about motor fuels than any other chemist on earth. The Battle of Britain became a testing and development laboratory in which a nation's life was the stake.

The work done in that laboratory, and in our laboratories here at home as an outgrowth of that experience, has precipitated changes in motor fuel technology of which the effects will be reverberating long after the peace. Fuels now can be made that can go beyond the octane scale. Their estimated octane numbers are of the order of 110 or 115 and even higher. They deliver one-half again as much power as 100 octane fuel. Looking upon the situation that is indicated for after the war, the petroleum chemist now sees all existing motors as out of date, with knowledge of fuels advancing so rapidly that September's motor might be out of date in October.

Let us glance at another phase of petroleum chemistry. A barrel of crude oil contains literally thousands of chemical compounds. The chemist has long been fascinated by the possibility that almost anything under the sun might be created with these chemical building blocks of hydrogen and carbon; that simply by the addition of oxygen and other elements in the proper combination, he might obtain new alcohols, esters, acids, solvents, perfumes, pharmaceuticals, and organic synthetics of every type. Catalytic cracking processes and adaptations of them, brought very recently to high stages of performance, are now leading toward this goal and taking petroleum chemistry into a realm once exclusive to coal-tar chemistry.

The largest catalytic cracking capacity in the world is being operated by American oil companies. Soon this capacity will approximate some hundreds of thousands of barrels daily. The significance of this development, well under way in 1939 but expanded to gigantic size by the needs of war, is beyond all present vision. Synthetic rubber, which as every chemist knows is not rubber at all but a new material of broader and yet more promising utility, is being produced from butadiene and styrene synthesized from petroleum. Toluene, best known as the basis of one of the most important of modern high explosives but also essential in dye chemistry and many other industries, is now a petroleum product.

A sign of the swiftness of the pace with which the hurly-burly of change is sweeping the petroleum industry, is given by a printed card that now hangs behind the desk of the research director of one of America's greatest oil companies. The card reads: YOU DON'T HAVE TO BE CRAZY TO WORK HERE, BUT IT SURELY HELPS!

May I add that a similar card could be hung with profit in every American office and shop and laboratory and farm barn. We are going to need to be "crazy," as judged by 1940's thinking, to make this upset world right again. We are going to need to be visionary to the point of audacity, in the light of today's evident facts, to discharge just a fair share of the post-war opportunities and responsibilities.

Plastics were of sensational promise before Pearl Harbor. The newest and most versatile of plastics will be available after this war on a scale beyond all previous conceptions. The high-pressure synthesis of ammonia, one of the major chemical exploits of the century, will have taken on an industrial status that, in terms of new producing capacity, may be comparable to the discovery of a sixth continent. The amount of fertilizer chemicals that this new capacity will be able to supply farmers for fertilizers will be so large that the basic trends of agriculture might be changed. And these are but one group of a hundred or more products stemming from this high-pressure synthesis, which utilizes air, water and coal as its building blocks.

We will have glass that is unbreakable and glass that will float, wood that won't burn, and laminations of plastics and wood that will compete with structural metals. Hosiery derived from air, water and coal, a wonder of pre-war days, is but the forerunner of many innovations from the same source, ranging from shoes that contain no leather and window screens that contain no wire, to machinery bearings that contain no metal.

Today, we produce to destroy. But tomorrow we will produce to build, and we will continue to invent and thus to multiply our possessions. Released by an American victory, the stream of production compared with its volume in the past, will be as a great river is to one of its tributary creeks. We will have at our command ten, fifty, a hundred times what we had before, chiefly of new materials.

That prospect is as certain as tomorrow's dawn. We need only to make the victory definite. Then, the choice will be ours, either boldly to harness the stream of plenty, or, if we are timid and of myopic or restricted vision, to be embarrassed by the very abundance of means we have created.

Fuels and metals and plastics are now ready to complete the revolution in transportation begun early in the century. The automobile manufacturer's slate has been wiped clean for a fresh start, which should result in new cars that will be of incredible efficiency as judged by present standards. Since motor car production stopped, the shiny new models that are now gathering dust in dealers' storerooms have aged, technically, at least two decades. We are now in the 1960's of motor cars, as measured by the old pace of development.

Sealed cooling systems, proved on large-scale by aviation, may end in the post-war car the nuisance of adding water to radiators. Weights may be half what they are, saving from 1,500 to 2,000 pounds of useless load. The power output per

HOW TO GET INTO AVIATION—NOW

by C. S. (Casey) Jones

Facts about the opportunities and training now available to those who wish to enter aviation.

What can I do to get into aviation? How can I become a pilot—navigator—bombardier—inspector—aircraft mechanic or engineer? What courses are available and what are the requirements?

C. S. JONES

Questions like these are constantly submitted to my associates and me. This is because our schools have long been engaged in training young men in the mechanical and technical phases of aviation. And, while our two schools are operating at capacity and primarily for the United States Army, we want to be helpful to any and all who seek an aviation career.

• • • •

Many thousands of ambitious and patriotic Americans are eager to get into aviation now. The government, the airlines and the aircraft industry are conducting training courses, in various phases of aviation, to prepare men and women for an early and active part in this industry which is so vital to the country's survival today, and which holds so much promise for the future.

There is a need for spreading information on this subject. Our schools have decided, therefore, to take space in a number of magazines—of which this is one—to answer questions and report facts on job and training opportunities which are now available in aviation. In so doing, we hope to render a service to the public, the aircraft industry and the air forces.

• • • •

Readers are cordially invited to submit questions, which will be answered in this column if of general interest.

• • • •

The next column to appear will contain information on the Airlines Training Program.

C. S. Jones
President

ACADEMY OF AERONAUTICS
La Guardia Field, New York City
CASEY JONES SCHOOL OF AERONAUTICS
1100 Raymond Blvd., Newark, N. J.

Training the Key Men of Tomorrow in Aviation

---

cubic inch of piston displacement may double, treble and even quadruple. Fuels may yield 50 miles to the gallon, or better.

In the oil industry they are speculating on fuels with octane ratings of 150, or almost twice that of the best automobile gasoline of two years ago. They say gasoline itself may be displaced by a superior petroleum product. They are talking of the practicability of midget automobiles for children.

Instead of rubber alone, there will be a hundred and one rubbers for tires and other uses. In tires, the indicated range is from all natural rubber casings, through varying combinations of natural rubber and synthetics, to the all-synthetics. When one remembers that at present the synthetics are being adapted to tire specifications written for rubber, and that the truly synthetic-type tire is yet to be engineered, the prospect is one of progressive changes.

The upsurge of automobile technology will be paralleled in aviation. Designers are thinking in terms of hemisphere-spanning freighters and of passenger air-carriers in fleets numbering hundreds of planes. Trans-continental non-stop air trains of gliders, which would drop off or pick up "coaches" over the principal cities enroute, are no longer figments of an imaginative air man's dream. They are probabilities. Leaders of the industry say that technical considerations no longer limit the size of airplanes that can be built.

Now present are most of the elements essential to the wide popular ownership of planes. Small, highly efficient, almost foolproof craft can be produced at low cost. An enormous plant capacity will be awaiting utilization, tens of thousands will have been trained in flying, and the post-war land will be dotted with air fields. Only within very large cities will we be deficient in field facilities, and there too the signs of impending change are clear.

As never before we are conscious of the need for cheaper and better housing. Crowded city slums stand as an ugly reproach to our lack of initiative and vision in home-building. The slums should be emptied after the war by the combination of forces that is being arrayed against them; and once empty, airports might well take over those bleak blocks.

It is coming because in no better way will we be able to put into worthwhile service the abundance of materials suitable for building all kinds of things. The very prospect of this plenty, on the one hand, and the all-too glaring lack of inexpensive modern housing on the other, have started men thinking who have given but little attention to this problem in the past. The engineer, the chemist, the production expert, and the development departments of some of our largest companies are alert to an opportunity, and will become productively interested the moment the war releases their services.

Coming Household Machinery

[*Continued from page 77*]

electrified kitchen can save the housewife, according to the experts: 95 miles of walking a year.

Obviously, your new kitchen will be anything but stereotyped. Plastics in all shades of the rainbow will give your individuality free rein. An energetic cook may go for a red refrigerator with green trim; a milder personality may prefer pastel shades. Unbreakable glass slabs, colored or clear, opaque or transparent, can be used for cabinet doors, counter tops, and other fittings. Frames will be of new light metal alloys, making doors permanently sag-proof and refrigerators so light that they can be shifted easily by the little woman. Trim can be of stainless steel or dull metals, or of beautiful plastic strips.

Now that you have had a square meal you will want to go into the living room to relax. Here you are introduced to lighting fixtures which have already made our present electric bulbs technologically obsolete. For many purposes the ordinary incandescent bulb is about as up to date as the one-lung car cranked from the side. Lighting engineers have a whole bagful of surprises for you after the war.

This room, for instance, has a glowing wainscoting stretching around the walls. It turns out to be a series of fluorescent fixtures flat as a pancake, and only gently warm to the touch. Luminous panels are inset around the fireplace; mouldings glow around the ceilings—in a score of ingenious ways fluorescent fixtures not only provide shadowless light but add to beauty of design. For reading and close work light is concentrated by individual lamps.

Oculists say that most eyestrain comes from insufficient light, glaring light, or too strong contrasts between light and shadows. All three of these hazards are largely eliminated by fluorescent bulbs, which give light by the reaction of an electric discharge upon fluorescing substances coating the inside of the tube. Because such light is cheap—fluorescent lamps cost about one-seventh as much to operate as ordinary light bulbs of equal power—you will be able to use it lavishly. Practically all homes at present are woefully underlighted, according to minimum optical standards. Most rooms are "spot" lighted—bridge and table lamps here and there giving bright areas in the midst of general dullness, requiring the eye to adjust as it turns from a bright area to a dark corner. Clever placing of fluorescent fixtures will illuminate a room as softly and evenly as north light through a studio window.

Unless you have a tropical temperament you have switched off room lights on a hot summer evening rather than perspire under their added heat. But fluorescent lamps are the closest thing yet to cold light—not quite as efficient as a lightning bug's tail in this respect, but no warmer than your own surface skin.

And imagine the steps you'll save by letting the sun turn on your lights. Up rolls a dark, black thunderstorm—on go your lamps, controlled by an electronic eye that turns them up like theater footlights when it gets dark outdoors. The storm passes and the lights are automatically dimmed. You can adjust the control mechanism to maintain inside illumination always at the constant level you desire.

The walls of your living room are a neutral gray but your eye thinks they are a cheerful pink or amber. You have favored that hue this week because it has been cool and you want a warm color scheme for the room. A quick and easy shift of bulbs in your fluorescent fixtures paints your gray walls with colored light and instantly changes the decorative scheme of the room. If it's warm outside, slip in blue bulbs and your pink wall vanishes as the color scheme shifts to cool sapphire or azure. Gold, pink, blue, green, red, white and daylight bulbs enable you to "repaint" your rooms any time you care to invest ten minutes in the bulb-changing process.

Here's another lamp which, when you turn it on, gives forth no light at all. That's what you think! The light is there, all right, but you can't see it because it is in the invisible ultra-violet

HOW THE AFRICANS TALK WITH DRUMS!

Haven't you always wondered just how the jungle natives have been able to spread a warning or report for miles by beats on a hollowed log?

From a missionary in Africa, Dr. A. I. Good, has come the first authoritative information on drum talk: the way the drums are made and tapped; how a whole phrase used for a name or word; and fascinating, never before reported details on the drummers and their mysterious telegraphy.

Read this absorbing article in January MECHANIX ILLUSTRATED!

range of the spectrum. It is called "black light."

Your wallpaper can see it, though. A design invisible in ordinary light glows pleasantly on the paper. Where has it sprung from so magically? It's there all the time, in fluorescing substances impregnated into the paper waiting for black light rays to bring them to life. Patterns and designs may similarly be painted on the bare walls if you wish. You can leave the room entirely dark, as in a blackout, but if the black light is on, the softly glowing patterns will keep you from colliding with the walls.

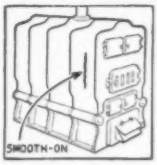
For better or for worse, that ancient alibi for a contused eye ("I ran into a door in the dark") is out for good. All such domestic obstacles—stair treads, banisters, doorknobs, mantels, and the like—will be just as visible in darkness as in daylight. All that is needed is a coat of phosphorescing substances which act as storage batteries for sunshine. Daylight, or even many types of artificial light, "charge" them so that they give off their stolen sunlight when darkness falls.

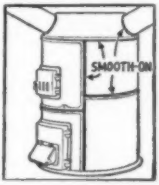
Such phosphors can even be incorporated into plastics, fabrics, oilcloth and enamel baked on sheet metal. When you sneak down to the kitchen for a midnight raid on the icebox you won't trip over the range and give the show away by an unholy clatter. For a rectangle of glowing oilcloth marks the position of a table; gleaming strips tell you just where to reach for the refrigerator door, and radiant knobs enable you to reach straight for cupboard doors. The glow can be green, yellow, orange or blue, depending upon whether zinc, cadmium, calcium or strontium sulphides are used, and the phosphorescence will last for from six to ten hours after each daylight charging.

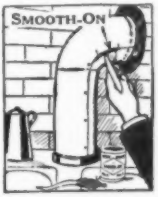
Scratch a human being and you find a soul that wants to be lazy. New furniture will be a great help toward that end. There will be fewer loose pieces because the trend is toward building many items right into the house package (MECHANIX ILLUSTRATED, November, 1942). Dressers, chests, storage cabinets and the like will be engineered as part of the entire design for house efficiency. With frames of light metal alloys, drawers of "cooked wood" of the type now used in making one-piece airplane fuselages, you'll never be troubled by drawers that stick in damp weather. Instead of pulling straight out, drawers can swing open on pivoted corners, each door fitted with a dust proof top. Beds made of this same remarkable wood product developed by the Vidal Research Laboratories will be so light that the housewife can push them aside negligently with one hand for cleaning purposes.

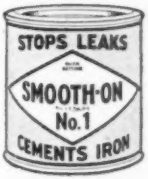
And tables, desks and chairs—how would you like them with a gleaming wood surface impossible to scratch with a jackknife, dent with a hammer, or mark with boiling water? Select a surface of bonded plastic plywood and that's what you'll get. You may even apply comparable surfaces by laying on a coat or two of the remarkable new paints that are practically plastics in liquid form. This is a very recent development

HOW TO STOP BOILER LEAKS
SECURELY . . . AT LOW COST









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coming out of the collaboration of the paint and plastics industries.

"We expect to offer the buying public paints, varnishes and enamels made with synthetic resins that will far excel any previously made," says Jerome J. Crowley of the O'Brien Varnish Company. "We hope to have finishes that anyone can apply, that will compare favorably with plastic table tops in their resistance to alcohol, scuffing, cleaning, etc."

Much post-war furniture will be highly functional—that is, small pieces will be available in ingenious collapsible designs. It is unlikely that the preference for "period" designs will immediately be overcome, but many of the more advanced designers look toward the day when furniture will be mass-produced as efficiently as the motor car, in standardized, inexpensive patterns. They point out that your refrigerator, telephone, and auto aren't Louis XV or Georgian and there's no reason why furniture need be. Collapsible units will find special favor with home owners whose work requires them to move frequently.

Certainly many of the heavy objects, such as wing chairs, sofas and love seats, will discard tediously glued and screwed wooden frames in favor of aluminum or magnesium ones which can be welded into a single piece almost instantly. This has already occurred in window frames, for example. Advantages are not only economy in labor but lifetime durability without repairs, plus a weight saving which enables a housewife to rearrange an entire room (and then restore things just as they were) without noticeable muscular effort.

Her use of the dustcloth will be largely academic when the house forced-air heating system is equipped with an electric air cleaner built into the furnace. Picture a room so free of dust that in one entire season you can't collect enough to write your name on a polished table top! You don't have to launder the curtains so often. Family dry-cleaning bills are reduced. Walls don't get that dingy, streaked appearance that sooner or later requires repainting or redecorating.

The gadget that outmodes the dustcloth is the Precipitron, developed by Westinghouse, and it thinks nothing of annihilating the 10,000,000 invisible dust particles that are frequently contained in one cubic foot of city air. It is a dust-magnet that sweeps air clean of motes as inconceivably tiny as the ones that make up tobacco smoke. You can blow a dense cloud of smoke into one end of the Precipitron and nothing emerges but clean air—the smoke is captured on a collecting plate and when enough is accumulated you can scrape it off.

It does the job by electrifying dust particles and then attracting them to a plate of opposite charge. Any home with a ventilating system or blower heat supply will be able to install one. Savings? Well, one great New York five-and-ten-cent store

PT boats in the Pacific sink Jap warships totaling 100 times the mosquito-boats' weight—small cruisers join the Coast Guard and help cut submarine toll of merchantmen—landing barges carry Marines, jeeps, and small tanks to South Pacific island beaches in successful assaults. You've read about them all—now you must read Capt. Charles Borden's authoritative, analytical report on the big place small boats of an amazing variety of types are carving for themselves in this war. You'll find it in the chock-full-of-news January issue of MECHANIX ILLUSTRATED.

An eye-opening discussion all you boat fans who follow MI will be absorbed by, it'll show how a new type of warfare is changing our ideas about the present and future design, usefulness, and versatility of small boats such as you yourself could operate.

was accustomed to redecorating its walls once a year at a cost of $4,000. A Precipitron was installed and after four years the walls were so fresh that when a newly painted panel was installed in a repair, no one could detect where the old paint left off and the fresh began. Savings in dust-soiled merchandise amounted to another several thousand dollars.

Naturally, some home laundering will still be necessary and there will be ingeniously refined washing machines that you will simply load with dirty clothes which you extract a few minutes later, thoroughly cleaned. Drying will be speeded by lamps which give heat without light. But many items, such as draperies, curtains and slip covers, will be made of such fibers as plastics and spun glass which can be kept perfectly clean by wiping off occasionally with a damp rag. Draperies made of Koroseal, a product of the B. F. Goodrich Rubber Company, can be washed down with a hose. The material never rots, so awnings made of it can be left on the year around without damage. Frozen water pipes cannot burst if made of Koroseal, which expands like rubber if ice forms inside, and is flexible enough to bend around sharp corners. The makers of Koroseal emphasize that these wonders have not yet been attained, even in the laboratory, but it looks forward to such developments after the war.

Like the kitchen, your bathroom will be delivered as a packaged unit. Lavatories, bowls and stools will be supported from the walls rather than by legs, so the unbroken expanse of floor can be kept hospital-clean. A Polaroid skylight admits sunshine from above; you can see through it but outsiders cannot see in. Your front door will probably have a panel of this same material for one-way vision. All upper rooms can have skylights, made opaque at will by turning a polarizing screen which shuts off light rays.

Tub and bowls will be made of warm plastics, of new type solid glass, or if you wish you can have a "cooked wood" tub which lacks the clammy coldness of enamel. Shower curtains of spun glass or partitions of solid colored glass are of course waterproof, and so are the glass or plastic-lined walls. At various levels above the tub are glowing Sterilamps, minimizing the danger of such infections as athlete's foot and bombarding your skin with bacteria- destroying ultra-violet rays as you bathe.

When you set a dial for bath water of a certain temperature, you'll get that and nothing else—no more hot and cold mixtures that freeze you one minute, boil you the next. Thermostatic controls will take care of that. Washbowls will have no projecting faucets or handles. Flush with the surface, like the control on your refrigerator, you'll merely touch a panel and water will swirl out from the rim of the bowl. Fluorescent panels framing the medicine cabinet give you perfect light for shaving. Lightless heating lamps incorporated as wall panels help to warm the room and dry your hair after a shampoo.

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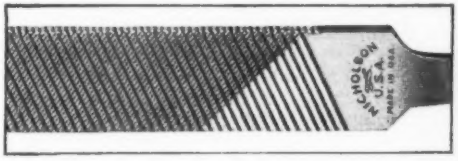

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Coming Household Machinery

[*Continued from page* 163]

You will be able to buy room air-conditioning units as compact and inexpensive as table radios. Certainly you will want one in the bedroom, for you can stand extremes of daytime heat and humidity if you get a cool night's sleep. These units will be available right after the war, but in the more distant future planners look to the day when freezing brine will be pumped under city streets along with the water supply, to be tapped and metered by every home owner who prefers to buy his conditioned air from the public utilities.

One recently perfected type of small air-conditioning unit not only cools a room, but uses cold air to heat it when desired. For cooling, coils collect heat from inside the room and pump it to another coil which dissipates it outdoors. To warm the room, twist a knob which reverses the process: heat is collected from outside air and pumped into the room through the inside coil.

Even air which is freezing contains a great deal of latent heat. In the average room, freezing air at 32 degrees Fahrenheit contains enough heat to melt a six-inch ice cube and boil the resulting water. So by this principle which engineers call reversed refrigeration (which becomes more understandable when you feel the heat pumped out of the cold air inside your refrigerator and released into the kitchen) you get free heat from cold air. Not quite free, because electricity runs the mechanism, but you get three times as much heat as is represented by the electric heat units you pay for. The device is most useful in fall and spring when you want to take the chill out of rooms without turning on the central heating system.

Another type of heating which intrigues inventors is more personal. You induce your own heat. Bathe a room with magnetic oscillations—a simple electrical accomplishment—and currents will be induced inside your body that warm you internally. Air temperature is of little moment: in a room cold enough to congeal your breath your electrical activity will keep you warm as toast. How soon this principle may be applied in the home is problematical, but it has been successfully in use for years in artificial-fever machines, used to bake certain disease germs out of the body.

If you're a busy gadabout person you can have a self-answering telephone. You leave the house to go shopping. In your absence the telephone rings, the receiver lifts off the hook and your recorded voice says: "Mrs. Jones will be back at six o'clock. Will you leave a message?" Whereupon the caller's message is magnetically recorded on a revolving steel tape and you play it off when you return. Then you demagnetize the tape and rewind it for further use.

So astonishing (and so secret!) are the wartime advances in radio invention that you may look forward some day to having your own private radio channel in the extreme short-wave frequencies. This means that you can dial a friend's frequency and get him on his personal radio-phone wherever he happens to be—at home, in his office, or lounging at the nineteenth hole.

Are you afraid of lightning? Stay at home and feel safe, if the house has a metal frame and stainless roof, as it very probably will. This arrangement provides a grounding-cage practically guaranteed to protect you against the highest-voltage bolt known to the heavens.

Before leaving this grand new house of yours we might advise you to get a hobby. You'll have plenty of time for it. For perhaps as amazing as anything about the peacetime home is the amount of work that will be done for you automatically by electronic controls. These are the astonishing devices that in highly secret form are helping to win the war—devices so hush-hush that engineers hardly dare breathe of their fantastic possibilities. Plane locators, gun-aiming mechanisms, submarine detectors, and a hundred other units can only be described after the war.

But their applications will revolutionize the average household. Some obvious ones may be suggested: Visitors drive up to your house after dark. They pass a certain point on the walk; the porch lights flash on and a bell or visual signal warns you to put down your paper and greet them. The same type of unit will warn you that someone is tampering with the baby's window or prowling around in the back yard.

"Anti-sabotage units will develop to a point of protecting homes as well as factories," says J. J. Kahn of the Standard Transformer Corporation.

Other electronic units will open your garage doors as you drive up in your car. They will close windows through the house when it starts to rain. They will remember to turn off basement lights at bedtime. They can control fireplace drafts, turn on the coffee, close shutters when hot sunlight streaks in and open them when the light fades, turn off the current when the toast is just the right shade of brown, tell you that back-up sewers are flooding the basement, report that the mailman has just dropped letters into the box—and you can go on endlessly from there.

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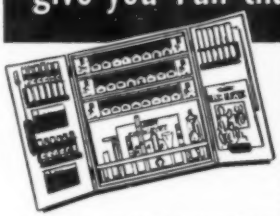

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The Yanks Attack

[*Continued from page 57*]

through, then opened up from the rear. Snipers in trees, behind rocks, concealed in buildings, harassed the Marines.

The enemy was concentrated, captured maps showed, in the ravine northwest of a precipitous rock hill, and on the slopes of the hill itself. Withering machine-gun fire poured on the Marines from pillboxes and dugouts. Also held up by heavy machine-gun fire was another company of Marines advancing southward.

At dusk a defensive line was organized northwest of this hill, but at 10:30 p. m. the Japs counter-attacked and broke their way through two companies of Marines, isolating one. The Japs worked north, fighting with knives, rifles, and grenades. One battalion commander evacuated his post only two minutes before the Japs occupied it.

In this grim night battle Lieutenant John B. Doyle, Jr., held a mortar observation post in front of the former British residency on the hill north of the playing ground. With only eight or nine men he pushed back the Japs, kicking them over the side of the precipice.

Next morning the Marines resumed the offensive. Two companies pushed through from the beach west of the playing ground. (Earlier they had mopped up the island's northwest end.) That gave the Marines positions for mortars and machine-guns on three sides of the main Jap position.

By mid-afternoon they had blasted the Japs from their strong-holds and completed possession of Tulagi. Snipers still concealed in trees, tall grass, and caves were found by the Marines when they twice combed the area the next day.

Not one of the hundreds of Japs surrendered. They had to be blasted out of each position. Their defense was built around small groups in dugouts and caves communicating with each other by radio. On the third day a Jap was still firing from his deep cliffside cavern after all his comrades had been shot. For two days he had lived with corpses, without food and water.

Three Japs, cornered, fired until they had only three rounds for one pistol. Then one of them killed his two companions and turned the gun on himself. Some caves were manned by 30 or 40 Japs. When the machine-gunner was picked off, another would take his place till the last man was dead.

The principal Japanese seaplane base in the Solomon Islands was located at mile-long Gavutu isle. Our dawn attack on the islands bombed all 15 planes there before they could leave the water.

Near noon the Marines' landing boats approached Gavutu from Florida Island. They came in under a rain of fire from hillside fortresses which began even before the assault wave formed. Concrete of the seaplane landing slips, broken off under naval gunfire and bombing, blocked landing on them. The Marines had to clamber on to a wharf higher than their boats, swept by machine-guns.

Their searing fire poured from scores of caves, many of them connecting and having chambers 20 ft. square, with which the Japs had honeycombed an 148-foot-high hill that rises steeply from the beach.

Many Marines showed great courage that day in assaulting this formidable stronghold. Capt. Harry L. Torgerson, for example, covered only by the fire of four of his men, rushed from cave to cave, hurling into them charges of TNT tied to boards with short fuses. By himself he closed up more than 50 of the pest-holes and came out of his daring day's work with only a wrist watch broken and his pants blown off.

Sgt. Harry M. Tully, who had seen many of his friends shot down in the first blasts of machine-gun fire from the cliff, for two days and nights operated as a lone wolf, surpassing the Japs in cunning and patience, picking them off one by one after lying in wait for long periods. From Gavutu he picked out machine-gunners on Tanambogo, 500 yards away, and shot them down.

By night he sat on the beach, watching the water for telltale traces of Japs as they swam behind logs. Once he watched a log float to the beach six feet from where he lay in wait. The Jap did not stir for 18 minutes, nor did Tully. Then the Jap lifted his head and Tully shot him.

In two days of fighting the Marines cleaned out the Japs from Gavutu. In the afternoon of the first day, even before their conquest was com-

HOW TO WIN THE BIG GAME

Thrilling escapes from death or capture by the Japs during the Solomon Islands fighting have occurred again and again, perhaps most often among United States airmen. One of the most spectacular was that of Lieut. Dick Amerine, 23-year-old Marine fighter from Kansas. Over Guadalcanal his oxygen failed. He bailed out, dropped into the ocean offshore, swam boldly in. He slipped past Japanese lines, used a boulder to brain a sleeping enemy soldier, killed three more with a captured pistol, lived on snails and ants, and finally was picked up by a Marine patrol.

To Lieutenant Amerine outwitting the wily Nips in war must have seemed a grim extension of the quick-thinking headwork he used starring as halfback on the University of Kansas football eleven just two autumns ago. Instead of Japs yelling bloodthirstily at him, he heard the stadium resound with "Rock-chalk, Jayhawk, K. U.!" when his alma mater met Missouri U. in the big game of the season. Now he and other Yanks are proving equally dextrous in the biggest game in the world.

plete, the Stars and Stripes were run up from Gavutu's hilltop. The Rising Sun was still floating over Tanambogo a half mile away, but the Marines shot it down, leaving Old Glory as the sole flag waving at dusk over the once-strong Jap base. It was at this time of August 7 that troops which had arrived on Gavutu from Florida Island were ordered to land on Tanambogo, which is connected by a small causeway. Heavy fire from the Japs made the advance impossible until five minutes of naval gunfire cleared the way. The last shell hit a fuel dump near the beach just as the Marines landed, brilliantly lighting the beach and silhouetting the attackers. The Marines were jammed between two piers, one of which had been built since their Australian guide last saw Tanambogo, and machine-guns strafed them heavily from a hill.

They were caught in a pocket, unable to peep over the edge of the pier or to set up machine guns without drawing withering fire. Their captain ordered the operation delayed until dawn and made his way back to Gavutu. Two of his men, stranded in the confusion, swam back during the night.

The next day the Tanambogo fortress was cracked when two tanks were sent in ahead of troops from Gavutu. One ran about 100 ft. inland, where the Japs swarmed over it, thrust an iron rod into the treads to halt it, poured gasoline over it, and set it afire. A Marine lieutenant opened the top of his tank turret, trained his AA gun on the Japs and killed 23 of them before he was knifed to death.

The infantry following the tanks avenged their comrade's death by finishing off the Japs with the tactics so effective on Gavutu.

Detachable Extra Wing Gives Wide Cruising Radius

An extra wing, which enables high-speed monoplane fighters and bombers to cruise as biplanes at economical low speeds over a wide radius, and which can be cast aside in midair to permit the craft to go into action at full speed, is the invention on which U. S. patent 2,277,242 has just been awarded to Vadim S. Makaroff of New York.

The wing and its supporting strut or struts is made as a single, self-contained unit. The strut is locked firmly in a socket in the fuselage, much as a mast is stepped in a boat, but the locking device can be released in an instant by the pilot, permitting the wing to be lifted off and carried away by the air current. Since it is intended to be jettisoned after it has served its purpose, the auxiliary wing should be built of light, inexpensive materials, the inventor suggests.

In addition to giving the necessary lift for economical low-speed flight, the extra wing contains a gas tank. Fuel from this is of course used first, so that it is empty when the wing is permitted to go overboard.

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New Products And Inventions

Army Air Force engineers saturated an old plane with 200 gallons of gasoline, set it afire, let it burn 90 seconds before summoning a new fire-fighting crash truck equipment to spray carbon dioxide. Here flames retreat before CO_2.

Wrapped in a blanket of carbon dioxide, the flames simmer down to the vanishing point. At this point rescuers in asbestos suits could enter the plane, the carbon dioxide (it's 110° below zero) having reduced the temperature.

Stopping gasoline and oil fires in hangars with veritable floods of carbon dioxide gas, released from huge containers as big as tank cars, is the method for making aviation property safer on which U. S. patent 2,274,784 has just been granted to Eric Geertz of Glen Ellyn, Ill.

Oil fires, the inventor points out, must be combated with something besides water. Liquid carbon dioxide, which turns into gas upon release of the pressure under which it is stored, has been found an effective means for putting out such fires. It has a double effect; it cuts off the supply of oxygen, and at the same time often reduces the temperature so sharply as to reduce the fuel below ignition temperature.

One drawback has always been that carbon dioxide is ordinarily available only in pressure cylinders such as one sees in drugstores. Hundreds of these would have to be opened simultaneously to have much effect on a fire in a big hangar.

To get around this difficulty, Mr. Geertz proposes the use of containers about as big as railway tank cars, situated between the hangars, and fitted with pipes leading to strategically located outlets in the interior.

In an adaptation of this idea, Mr. Geertz' invention has been utilized for fire-fighting airport crash trucks where it is often vital to extinguish badly-flaming airplanes without delay if lives are to be saved. (See photos above.) The possibilities of this method of fire-fighting in aviation were indicated in "Bottled Warfare" in the June issue of MECHANIX ILLUSTRATED.

Rights in the patent have been assigned to the Cardox Corporation of Chicago.

* * *

Motor vehicles that steer with rear as well as front wheels are the subject of patent 2,274,821, issued to Allan P. Bloxsom of Houston, Texas. Each wheel has its individual steering knuckle, and turning is accomplished by means of push and pull from hydraulic cylinders. These are connected, by means of appropriately arranged tubing, to other cylinders whose pistons are moved by the turning of the steering wheel. The inventor claims that vehicles equipped with his system not only handle better on the road but are much easier to park.

* * *

"Salting" tire treads will make them go much farther, in terms both of rubber economy and of grip on the road, is the claim made in favor of the invention of Edward H. Wallace of Detroit, covered by patent 2,274,855.

Basic idea of Mr. Wallace's patent is the embedding of bits of soluble substance in the tread mass. As the rubber wears down, the cavities in which they are embedded are opened up and the substances dissolve, keeping the surface always properly roughened and preventing the tread from becoming "slick."

In an earlier form of the invention, starchy materials like bits of vermicelli were used. These, however, became "gooey" as they dissolved, increasing the tendency to skid. In the new form, crystals of common salt or a related chemical compound are substituted for the starchy stuffs. These crystals dissolve out cleanly, and even reduce the slipperiness of lubricants already on the pavement.

Mr. Wallace has assigned rights in his patent to the United States Rubber Company.

* * *

Bubble-free glass for windows, windshields, lenses and optical instruments of all kinds is expected from the process patented (No. 2,274,643) by F. W. Adams of Pittsburgh. Rights are assigned to the Pittsburgh Plate Glass Company.

In Mr. Adams' method, carbon monoxide is bubbled through the molten glass as it flows through the furnace. The monoxide treatment may be followed with a second bubbling, this time with oxygen, air or other oxidizing gas. After the bubbling, the molten mass is permitted to stand quietly for a time, until all bubbles have risen to the surface and escaped. Mr. Adams claims that his method will produce glass quite clear of the tiny imprisoned bubbles, or "seeds," that constitute troublesome imperfections in glass made by present-day methods.

[*Continued on page* 170]

Your Inventon Clinic

[Continued from page 12]

Rifle Grenade

Henry Gordan, Kew Gardens, Long Island, asks for an opinion of a grenade designed to be shot from an ordinary rifle.

ANSWER: *If you will refer to any good book dealing with ordnance, you will find that substantially the same weapon was used during the last war both for hurling explosive and gas shells. Your modification presents nothing original.*

Oil Heater

A. E. Evenson, Bartiesville, Okla., discloses an idea for a unit type oil heater which can be added to an airplane engine. He wants our opinion.

ANSWER: *There are many places where such a heater could not be employed, because of an insufficient supply of electrical energy. Furthermore, it has been found that such heaters are of only minor value in frozen wastes. Aviators working in climates which are constantly low seem to prefer to heat the entire engine and thus be assured of proper combustion and lessened danger of cracking cylinders and spark plugs.*

Nevertheless, your suggestion is of sufficient value to warrant further investigation and experimentation. Of greatest moment is the need for a quick disconnecting plug of the non-flashing type. Here, utilization of the Davy safety lamp principal could be utilized.

Wrench, Novelty and Seed Planter

Sam J. Bates, East Point, Ga., submits three ideas for comment. The first is a novelty advertisement; the second, a one-handed wrench and the third discloses a seed planter.

ANSWER: *We do not look with favor upon the novelty advertisement nor the single handed wrench. There are better products than either upon the market.*

The seed planter is worthy of further work. If you can make this in such a form that the seeds will be delivered one at a time and that the planting stick will be automatically advanced as the planter is manipulated by hand, we think that you will have developed a saleable article. A letter is being sent to you to give you some suggestions upon which you can work. Perhaps as you give this matter more thought you will be able to develop a better system.

The inexpensiveness of the commercial production of such a planter would bring the item within reach of all amateur horticulturists. Making the item of metal might be difficult during the war, but you should try to get it ready for the market during the great reconstruction period which is to follow.

This suggestion is worth developing. Good luck to you in your efforts.

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New Products And Inventions

[*Continued from page* 168]

Scratch-proof Plastic Lenses

Plastic lenses for cameras, spectacles and other uses can be protected against scratches and other injuries that have been their principal drawback by coating them very thinly with glass films, Frederick J. Binda of Boston points out in his description of a method on which he has just been granted U. S. patent 2,287,546.

Plastic lenses can be made very rapidly and cheaply and would undoubtedly have much wider use than they enjoy at present if they were not so easily scratched. Mr. Binda overcomes this difficulty by blowing a bubble of hard glass in such a way that it comes into contact with one side of the lens. The film of molten glass, which may be as thin as a few ten-thousandths of an inch, cools, hardens and sticks tightly to the lens, giving it a scratch-resistant surface.

Mr. Binda suggests that his method may be used, among other purposes, for protecting plastic sun goggles containing embedded layers of light-polarizing particles—a type of eye protection that has become increasingly popular in the last couple of years. He has assigned his patent rights to the Polaroid Corporation, which manufactures such materials.

Light "Sifted" Through Wire Screen

The same corporation is assignee of patent 2,287,598, which Charles H. Brown of Baldwin, N. Y., obtained on a new method for polarizing light. Polarized light is light that has been passed through a medium that causes all emerging light waves to vibrate in the same plane. Light of this kind has many scientific and industrial applications.

In Mr. Brown's new method, very fine wires are used as the polarizing means. He embeds a grid of them in a mass of powdered glass, then applies heat and stretches molten glass and wire grid together, until the wires are microscopically thin, and are crowded together on the order of tens of thousands to the inch.

Another method is to pass fine wire (preferably platinum) in a slender glass tube, then soften the tube with heat and wind it into a tight, flat coil on a metal drum. The sides of the tube fuse together, forming a continuous cylinder in which the parallel, fine-pulled wires are embedded. This can then be slit along one side and further stretched, forming a flat sheet of polarizing material.

Hydraulic Wheel Drive For Motor Vehicles

Resembling the "windmill" hydraulic clutch now popular on automobiles, except that it is applied directly to each drive wheel, is the power-transmitting system patented (No. 2,287,498) by William W. Scofield of Old Greenwich, Conn.

Within the hub space of each wheel is a drum containing a set of radial vanes. A similar set,

To save steel and make razor blades last, this sharpener is being marketed. Blade is stroked back and forth between hone and pressure clip.

ANSWERS TO QUIZ QUESTIONS

1. True.
2. False. "Angle of attack" is the angle at which a plane strikes the air on the takeoff.
3. True. It means eating horse meat.
4. False. An arched brace.
5. False. Napoleon was taller than all three.
6. True. As a matter of fact, 11 months have 30 days—or more!
7. False. *Pure* water is a poor conductor.
8. False. Consult a global map.
9. False. The reverse.
10. True.
11. False. They give only about 50 per cent of the light.
12. True. The scientific name for the porcupine.
13. True. An ancient Persian measuring unit.
14. False. Three do.
15. True. A group of soldiers stopped him and took away his horse.
16. False. They were, "C. Latham Sholes," name of the inventor.
17. False. The shark has no bones. His skeleton is entirely cartilaginous or gristly.
18. False. See page 40.
19. True. As well as being a poet.
20. True. The ears throw off heat.
21. True. An apple gives off ethylene gas, which causes flowers to wither.
22. False. It rises.
23. True. According to scientific tests.
24. True. An old folk belief proved scientifically.
25. False. Used in airplane instruments.

Attention, MI Readers!

We will pay $1 for each true-false statement which we find acceptable. Statements will not be acknowledged or returned. Address the Quiz Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

Checks have been mailed to the following: Harry Lieberman, Evansville, Ind.; Daniel Stouffer, Buffalo, N. Y.; John H. Spicer, Owen Sound, Ont.; Donald E. Gates, Worcester, Mass.; Norman Martin, Mimico, Ont.; Nancy Morris, Chicago, Ill.; D. McMillan, Thorold, Ont.; H. Schindelman, Pittsburgh, Pa.; Jeannette Glynn, Savannah, Ga.; Tony D'Abrosca, Natick, R. I.; Herman A. Moran, Represa, Calif.

just clearing them, moves in a liquid medium, with power supplied from the motor. Each wheel thus acts independently of the others, eliminating the need for a differential.

Stall Warning Indicator For Planes

Warning of an approaching stall, bugbear of all aviators, is given in a device on which patent 2,287,497 was granted to William C. Rockefeller of Pasadena, who assigned his rights to Vultee Aircraft, Inc.

When a plane is flying normally, air flows evenly over both surfaces of the wing. When it is about to "get stuck in the air" and go into a stall, there is a back-current flowing momentarily the wrong way over the upper surface of the trailing edge. Mr. Rockefeller takes advantage by placing a suitably pointed opening near the trailing edge; from this a tube transmits pressure changes to a diaphragm within the wing, and this in turn actuates an electrical instrument to warn the pilot of the approach of stalling conditions.

Floating Drydock To Raise Sunken Ships

Some of the many torpedoed ships now on the bottom may be raised and put to work again through the invention of Charles O. Knudsen of Brooklyn, on which patent 2,287,434 was granted. It consists of a floating drydock, with hollow walls compartmented for buoyancy. It can be sunk by admitting water, re-floated by pumping in air. Two such docks, one under either end of a sunken vessel, could raise her, the inventor claims, and then carry her to harbor for permanent repairs.

"Dry Ice" For Refrigerator Cars

Solid carbon dioxide, or "dry ice," is used for cooling refrigerator cars in the system covered by patent 2,287,492, granted to Harry A. B. Brown of Pittsburgh. It has the considerable advantage that dry ice packs many times more chill, bulk for bulk and pound for pound, than ordinary ice; furthermore, it evaporates cleanly as it is used up, and does not leave a wet, drippy, mold-encouraging mess behind.

The solid carbon dioxide is much too cold, however, for direct contact with foods and beverages under shipment, so it is used to cool the fluid in a system of circulating tubes or pipes, which in turn keep the contents of the car down to the desired temperature.

Method For Salvaging Scrap Rubber

Rubber from the old tires, overshoes and hot water bottles now being collected in the scrap rubber drive may find its way into war uses by way of a method patented (No. 2,287,095) by Albert G. Federman of Chester, Pa. Mr. Federman

[*Continued on page* 175]

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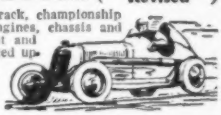

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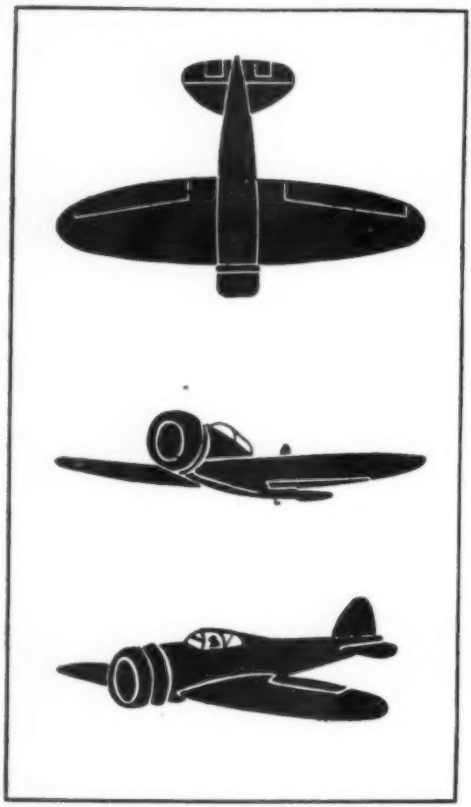

JAPAN'S unbelievably nimble Mitsubishi Zero fighter has earned the wary respect of United Nations air forces in the Far East. Officially known as the Mitsubishi Type 0 single-engine fighter, the ship is a low-wing monoplane with a high enclosed cockpit and a wing span of 37 feet. Built largely of plywood and fabric, and without protective armor against all-metal American-built fighter planes, it is quick to break up under gunfire or a swift pull-out after a dive. These disadvantages of its extreme lightness also constitute one of its excellences for, powered with a 1,275-horsepower aircooled engine, it gets speed in excess of 400 miles per hour.

This speed makes Zero a rarely efficient fighting machine giving plenty of trouble to the more powerful but heavier and less maneuverable fighters favored by U. S. (and German, incidentally) designers.

We Kept The Tigers Flying

[*Continued from page* 156]

Six bombers and three Zeros went down in flames in that first mad dive. And then we were pulling back on our sticks and the P-40's flattened out so fast that you'd smack your head against the back of your seat. A second later you're zooming up from under the bombers.

But you didn't play that game with the Zeroes. You only make one pass at them. And then you keep right on going. The Zeroes could maneuver circles around our heavily armed and armoured planes. If you didn't get them the first crack, you spent the rest of your energy trying to keep them from getting you.

Nine more bombers went down in flames in that second dive by the Third Pursuit. Their rear gunners were making the sky blue with tracers, but it didn't do them any good.

We figured later that several others went into Martaban Bay, but we didn't get credit for these as the British kept the score and they only allowed us credit for planes which crashed where they could find the ruins.

The bombers fled in a hurry then, but the Zeroes stayed around looking for a fight. We didn't take them up on it, though. We didn't want any part of the Zeroes or the Jap M-97's or M-96's

Those planes, built without armour and with no excess weight at all, could easily outfight us in a straight dog fight. The only advantage we had over them was our ability to go into a fast power dive. With our heavier ships, we could gain incredible speed in no time at all. A Zero, attempting to dive at four fifty or five hundred miles an hour, would tear itself into pieces.

Our P-40's had another advantage over the Zero. We could take a bullet whipping a lot better than the Japs could. We had good protective armour. And we had superior firing power. In a pinch, we could even outrun the lighter craft, although that was risky stuff, as he was *almost* as fast as we were.

Our Squadron lost two boys during that engagement. Neil Martin and Hank Gilbert crashed. Paul Green bailed out at fifteen hundred feet and in opening his chute at once, he almost lost his life. The second his bag blossomed, the Zeroes were on him. They did their best to cut him to ribbons, but he managed to escape them by spilling his wind and side slipping first one way and then the other. After that we always made delayed landings.

We took it pretty hard when we'd lose pilots, and most of us took it almost as hard when we'd lose ships. We only had a hundred crates to begin with and they were wearing out fast. Replacements were almost impossible to get, and it was a tough job keeping them in shape. Whereas the regular army fighting plane has a ground crew of almost a hundred men, we didn't average more than twenty-five.

By the time we had had a few more engagements with the Japs, they were mad as hornets.

We Kept The Tigers Flying

Their constant losses cost them face, as well as planes and pilots. Their propaganda programs were filled with insults accusing us of cowardice, because "we refused to stand up and fight with them." But we knew what we were doing—we were out to bring down bombers, not risk our pathetically few planes needlessly.

It was late in February, while I was on an escort mission with four other boys to Balin, that I ran into real trouble. We were up around fifteen hundred feet and I was rolling my head keeping a sharp watch when I spotted them. Not one plane and not a dozen—but forty, tough Jap fighters. Where they came from so suddenly, I'll never know. And I didn't have time to guess during the next hysterical few minutes.

They were on our tails in a split second. Everywhere the sky seemed suddenly filled with orange suns. They kept no formation but came in like a flock of sparrows. Well, that was one time we did dogfight the Japs! We turned and we went right for them, all guns wide open. I could see my tracers sweep across an M-97 and then there was a second one in front of me. They seemed to fall away almost together.

It was the most confusing few seconds of my life and although it was all over within ten seconds, it seemed like hours. After that one quick turn and dive-in on them, we peeled off and lit out for home. Our bombers already had started out for Tarmac. John Farrell, one of the boys who had been with us, and who by his quick-witted maneuvering had actually been responsible for saving us all, received a bad cut in the eye and I thought for some time that he had been shot down.

That group of fighters had been escorting a formation of bombers which later that day attacked Rangoon and made a shambles of the city. And so, although we were credited with four planes down and two probables, we considered it no real victory. The Jap bombers had got through by sheer weight.

I could go on endlessly talking of experiences I had while I fought in China and Burma. What I mostly remember is the terrible handicaps we had in fighting with too little equipment, with too few pilots and with too few mechanics. But I can say one thing which is optimistic.

Our planes stood up plenty well and the pilots who flew them stood up. The A.V.G. record was 500 planes shot down, as against two A.V.G. pilots killed on the ground and only twenty pilots killed by enemy action.

What we need now is not so much better planes and better pilots, but *more planes and more pilots.*

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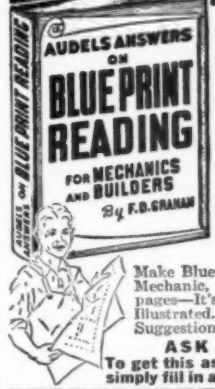

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Check-List of Army Jobs

Run down the civilian hobbies and occupations in the first two columns. When you find the one or more equivalent to your present avocation or work, opposite it will be the places in the army you're most likely to fit into efficiently and happily. If your qualifications are like those indicated by a check mark at left, you are among the most needed in the ranks of enlisted men.

	YOUR HOBBY or CIVILIAN JOB		ARMY JOB	SERVICE BRANCH
✓	Machinery, mechanics	Aviation, auto, truck, diesel engine, marine engine mechanic	Mechanic	All branches; Marine Engine Mechanics in Engineer Amphibian Command
	Carpentry, house building, wood-working	Construction foreman or employee; contractor; cabinet-maker	Construction foreman; carpenter	Construction Engineer Command
✓	Working with fine tools; laboratory work	Dental and medical laboratory technician	Dental technician	Medical Corps
✓	Electricity	Electrician, electrical engineer	Electrician, elec. engineer	Signal Corps, Air Force
✓	Radio	Radio operators, repairmen, technicians	Operator, repairman, technician	Signal Corps
✓	Telegraphy, telephony, communications in general	Telegraph and telephone operators, repairmen, experts, installers	Same as civil life	Signal Corps
	Skiing, winter sports, mountaineering	Ski instructor	Instructor	Ski Troops, Snow-Shoe Troops of Infantry
	Mathematics	Accountant, bookkeeper	Accountant, navigator, range estimator	Finance Dept. Air Force Artillery
✓	Physics, electronics	Physicist	Electronics expert	Signal Corps
✓	Transportation	Traffic manager, transportation expert	Handling traffic on water, rail, highway, or air	All branches
	Weather forecasting astronomy	Meteorologist	Weather forecaster	Air Force
✓	Chemistry	Chemist, powderman, (explosives experts especially needed)	Chemical warfare researcher, tester of munitions; explosive operator	Chemical Warfare Section; Ordnance, Artillery
	Cooking	Chef, baker, short-order cook	Cook, baker	All branches
	Engineering, surveying, instrumentman	Engineer (electrical, civil, mechanical, industrial); surveyor	Engineer	Corps of Engineers
	Mechanical drawing	Draftsman	Draftsman	Corps of Engineers
	Drawing, painting, designing	Artist	Camoufleur	Topographic Btn., Corps of Engineers
	Maps	Cartographer	Cartographer, map-reader	Topographic Btn., Corps of Engineers
	Motor boating	Boat operator	Crew or officer of assault boats	Amphibian Command
	Boat building	Boat-yard supt.	Boat maintenance	Amphibian Command
	Photography	Photographer	Photographer	Signal Corp, Air Force
	Athletics	Phys. ed. instructor, pro or semi-pro athlete	Parachutist	Parachute Troops
	Metal-working, gun repair	Metal-worker, gunsmith, small arms expert	Armorer	Ordnance
	Instrument-making, repairing	Instrument-maker, repairer; locksmiths	Same as civil life	Ordnance
	Business practices, statistics	Business executive, administrator, statistician, accountant, office machine operator	Admistrator, statistician, accountant	Administration War Dept.
	Driving autos	Auto-, truck-, taxi-driver	Driver	Armored Div., Motor Transport
	Motorcycling	Motorcycle dealer, repairman, trick-rider	Dispatch rider, instructor	Armored Div., Infantry, Cavalry
	Marketing, merchandising	Purchasing expert	Purchaser	Quartermaster Corps, Procurement
	Social work	Personnel technician, consultant	Classification officer	Administration
	Club, union, lodge, group leadership	Organizer, leader, group sec'y.	Officer	Any Branch

New Products And Inventons

[*Continued from page* 171]

gets rubber out of scrap by putting the scrap into a pressure cylinder and subjecting it to steam at a temperature between 225 and 255 degrees Centigrade. The hotter the steam the more quickly the rubber comes out.

A variation of the long-popular game of shuffleboard has been devised by G. Everett Stirk of Harrisburg, Pa., who is publicizing it under the name of the Keystone Game. The title is derived from the shape of the box toward which wooden disks are pushed by the players, who can number two or more. Scores are recorded according to the figures in the boxes in which the disks stop.

* * *

A patent that came too late, might be the title for No. 2,274,984, granted to S. A. Huebner of Forest Junction, Wis., on a method for modernizing wooden wagon wheels. He applied for a patent on his invention on July 11, 1940. In essence, it consists in shortening the spokes uniformly and attaching a rim bearing an inflated rubber tire. Comes the war, snatching all rubber tires off the market—and Mr. Huebner's invention is out of action for duration.

* * *

You can make your electric fan warm you in winter by attaching the device on which patent 2,274,935 was awarded to James M. Naul of Fanwood, N. J., who has assigned his rights to the Singer Manufacturing Company. It is an electric heater, readily attachable to the front of an ordinary electric fan. The fan blows air through the heater, which warms it up and circulates it.

[*Continued on page* 181]

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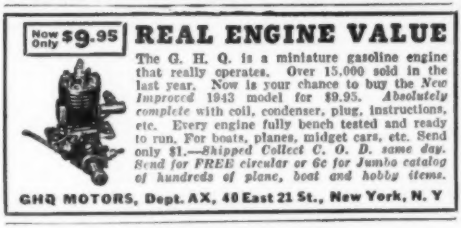
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Pictures By Candlelight

[*Continued from page 99*]

illumination is utilized. The first is to supplement the light of the candles with spot lights so the finished result will appear as if the candles had furnished the sole means of illumination. The spot light is placed in a direct line with the candle and subject, with care taken that the candles themselves do not cast a tell-tale shadow on the subject, indicating that another source of light was used.

The alternate method is to add the lighted candles to an obviously "normal" lighting, with the proper balance existing between the two. The strength of the floodlight illumination will be determined by the amount of halo around the candle flame that is desired. In cases where there should be a comparatively large halo, a low intensity of supplementary illumination should be used; if a small halo is preferred, the intensity of the additional light should be quite high, so that the candle flame in the picture area will not have an opportunity to be recorded by excessive negative density. On the other hand, if just an outline of the candle flame without its halo is the effect preferred, it may be necessary to use a double-exposure technique when taking the picture. This would entail making the normal exposure of the scene with the candles *unlighted*, and then after this exposure has been completed, lighting the candles and making an exceedingly short exposure (of from 1/50 to ½-second duration, depending on the diaphragm opening used and the speed of the film) for the candle flames alone. From this, it can be seen that the longer the exposure on the film, the greater will be the halo of the flame and vice versa.

Spectacular use can be made of this halo effect in such pictures as a still-life Christmas scene (which may excellently serve as an original Christmas greeting card). Long exposures of a steadily-burning candle flame will yield an extremely bright halo, lending an ethereal or mystic quality to the entire picture. This is, no doubt, the way you will want to handle close-ups of the flames and a bit of the candle proper, with the desired amount of diffused auxiliary light added. Often, the smoke swirling upwards from one or two just-extinguished candles out of a group creates very unusual patterns which may be used to advantage if captured by the exposure at the right instant.

The next time any event like a birthday, Halloween, Christmas, or Easter party occurs, or where candlelight pictures would suggest the theme of the occasion, do not let the opportunity go unexplored. Candlelight is salon subject material too, which needs only an imaginative photographer, a fast film, and a little patience to achieve pictorial results.

There are 187 known species of oysters, some of them native to only one spot in the world.

Flash Synchronizer

[*Continued from page 103*]

metal one, it is a simple matter to drill a small hole through it and thread it with a 6-32 tap. The unit can then be attached with a 6-32 machine screw.

To keep the contacts separated until the exact instant the picture is taken, make a pointed bakelite spreader from a 9/16x¼-inch strip of bakelite to attach to the shutter cocking lever, as shown in Figures 4 and 8. Cut a 5/16-inch long slot in this bakelite spreader to permit lateral adjustment. Next, to hold this spreader to the shutter winding lever, make the "U" shaped bracket shown in Figure 8. A small nut, soldered to the inside of this bracket provides a means of holding the adjustable bakelite spreader; the latter is fastened to the nut with a small screw and, can be adjusted back or forth by loosening the screw. The bracket can be attached to the shutter cocking lever with a tiny nut and bolt or with a small nail, passed through both and soldered in place. The two units should come together in perfect alignment when the shutter is cocked and the pointed bakelite should slide in between the two spring contacts and spread them apart, as shown in Figure 5. The wire connector that plugs into the metal tube of the shorter spring synchronizer contact can be made by soldering a small wire brad to the end of the wire and slipping a small piece of rubber tubing over the soldered connection. The brad should fit snugly into the metal tube socket.

The battery case used is adapted from a 98-cent, non-synchronizing flash outfit—with a push-button switch. To adapt it to this synchronizer, first break out a section of the brass strip below the push-button as indicated in the drawing in the lower left-hand corner of page 103. Attach the wire connected to the metal tube on the shorter spring of the switch to the upper half of the broken brass strip—below the button switch, after drilling a small hole in the case. If the camera has a metal body, it is only necessary to bolt the bottom of the battery case to a metal bracket which is bracketed in turn to the tripod socket of the camera or to some other metal part of its frame. Otherwise, a wire must be attached to the longer of the spring contacts, too—its other end leading to the screw-on bottom of the battery case to complete the circuit set up.

[*Continued on next page*]

Answers to Quiz on Page 145

1—Hide
2—Gross
3—Lead
4—Water
5—(a) Centigrade
(b) Fahrenheit
6—Electromagnetic Induction

Flash Synchronizer

The push-button switch of the battery case acts as a safety switch, for the flash lamp screwed into the bulb socket will not go off unless the button is depressed when the spring contacts of the switch on the camera go together. This permits the photographer to load a bulb before cocking the shutter and spreading the contacts of the switch with the bakelite spreader. Naturally, the photographer will not depress the button safety switch until he is all set for the actual exposure.

It is best to adjust the slot in the bakelite spreader so that the maximum intensity of an SM bulb is obtained with a shutter speed of 1/200th second. It may be necessary to waste several bulbs and negatives to determine the exact point, but once this setting is established it will do for maximum efficiency with all higher and lower speeds too. A simple test consists of flashing (at an opening one stop smaller than normal) a white or light-colored wall in a darkened room. The film with greatest negative density will indicate the optimum setting of the adjustable slot in the separator.

Since the structure of our synchronizer makes it necessary for the shutter mechanism to be in motion at the instant the flash circuit is closed, the time to the flash must be approximately equal to the interval from the tripping of the shutter to the opening of the shutter leaves. In cocking shutters of the type described, the shutter "lag" is 5 milliseconds or 1/200th second. The Speed Midget or SM Mazda flash lamp is the only one available today that comes to its peak in as brief an interval as 5 milliseconds. Other lamps require 20 milliseconds (1/50th second) and longer to reach their peaks so that the lamp circuit must be closed *before* rather than after the shutter is tripped if peak synchronization of lamp and shutter opening is to be obtained at higher shutter speeds. Thus, when the synchronizer described in this article is used with other lamps than the SM, a shutter speed of 1/25th second (or 40 milliseconds will be needed to embrace the 20-millisecond "lag" and the peak of the lamp since the contact is closed shortly *after* the lever of the shutter is tripped.

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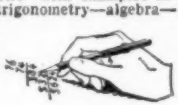

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Light "Painting"

[*Continued from page 96*]

subject from the other side of the camera to fill in all of the shadows and show the detail in all crevices.

Since the operation of waving the movable light takes time, rather long exposures ranging from twenty seconds to several minutes are in order. For this reason, only inanimate subjects can be photographed by this method, and slow films are preferable. To prolong the total exposure time as much as necessary, one must stop down the lens considerably.

Light painting is specially applicable to still-life and table top sets (like the ones illustrated) in which the camera must be close to the "set" to create a plastic three-dimensional perspective, whereas the normal placement of conventional light sources would be far back of the camera and tripod. The single, moving light used from the camera position, as illustrated on page 96 does admirably; note the white cardboard which serves as a background and reflects light along critical edges of the subject in a modified back-lighting effect. Certain subjects can be treated best by waving the single light source at different portions of the white background for the larger part of the exposure's duration and then filling in briefly in front. It's up to you to learn variations of this kind and to take fullest advantage of them.

You are, no doubt, curious about the subjects illustrated and the little actors. If you have a friend who is interested in miniature railroading he can tell you all about them. The figures and all other objects in these two pictures are in quarter-inch-to-the-foot scale.

The miniature figures and model railroad parts are obtainable from any store dealing in miniature railroading supplies. It requires only a little ingenuity to plan other set-ups that do not require the more expensive model railroad equipment shown, however.

The figures themselves have been slightly revamped. They look more realistic when their leaden bases are removed. The lead from which they are made is quite soft and may be cut with a knife. A pin driven into the leg and cut off will serve as a peg to maintain any one of the figures in an upright position.

"Painting" is usually a "must" technique in photographing house interiors to show furniture and decorating at their finest and little-shadowed best.

A Terraced Garden

[*Continued from page 129*]

up-and-down paths in the form of long, sweeping curves. Then break them up into short runs by offsetting their intersections with the cross paths as shown.

Heavy flows of rain water can be prevented from gutting the paths at the intersections by establishing sumps at these points. As shown in Fig. 3, a sump consists of a low point, or slight dip, in the cross path in which the water is forced to collect, thus retarding the onrush from above. A thick planting of perennial sedum, serving as a filter through which the overflow can drain off without washing soil with it is used to bolster up the lower side.

Of course, other kinds of low-growing ground-cover, such as the various ivies, myrtles, and other perennial trailers, may be planted here as well as on the banks and around the beds. Few, however, are as fast-spreading, easy to trim out and transplant, and thrive with so little care as sedum.

The Golden Moss variety shown in Fig. 4 makes a very good soil retainer. It grows 3 inches tall, has light green, moss-like leaves and is covered with bright yellow flowers from May to July. During this period the sedum appears luminescent at night, softly outlining the geometric patterns of the beds and parkways.

It is a good idea to complete the grading and start the border and bank planting of a terrace garden the season before it is to be used. Steps and paths will have packed down firmly by then and can be used freely the following year without fear of damaging them. Any time during the summer, and even early fall, sedum plants can be set in around the beds and sumps and allowed to grow out into thick blankets and drainage filters. The soil of the beds meanwhile can be tested and prepared for an early start at planting time next spring.

Cotton bred for a specific use in industry is a new development in this country.

"He claims it bit him!"

New 24-Inch German Cannon Uses Two-Ton Shells

Shells fired from the new 24-inch German siege gun, reported in action against Sevastopol, must weigh two tons or more apiece. No definite word from actual measurement or weighing of fragments has yet been received here, but if the caliber is correctly reported the approximate weight can be arrived at by comparison with known weights of other big projectiles.

Sixteen-inch shells, used in American and British ordnance, vary in weight from 2,100 to 2,400 pounds, depending mainly on length over all and thickness of metal surrounding the central cavity. Fourteen-inch shells weigh about 1,600 to 1,700 pounds; twelve-inchers around 850 pounds. Extrapolation from these figures gives a weight of 4,000 pounds or over as possible for a 24-inch caliber shell.

Two-ton airplane bombs are nothing uncommon nowadays. However, artillery shells of the same weight would offer several advantages from the viewpoint of the besiegers.

In bringing a super-gun into action, the Germans are upholding their tradition as bold experimenters in ordnance. The world stood aghast at the execution wrought by the "Big Berthas" on Belgian frontier forts in 1914. These pieces were short, massive mortars of 420-millimeter (16.535-inch) caliber.

Later, an extra-long rifle type was evolved, to bombard Paris at a range of 75 miles with light shells of 8.25-inch caliber. The name "Big Bertha" somehow got transferred to this Paris gun in post-war writings, but it never properly belonged to it. It was applied to the short, fat, big-caliber mortars in uncomplimentary allusion to the dumpy figure of Frau Bertha Krupp von Bohlen.

It is not likely that the new Sevastopol gun has a caliber of exactly 24 inches, since the Germans use the metric system, rather than the inch-and-foot method of measuring. It may be a caliber of 600 millimeters (23.622 inches) or 610 millimeters (24.041 inches).

Giant-calibered guns are no new thing under the sun. Near the end of the Middle Ages, less than a century after gunpowder began to be used in war, the Flemish city of Ghent had a 25-inch iron gun built, that threw solid stone balls weighing 700 pounds. This monster is still a show-piece in Ghent. Even the practice of naming guns is not new: this forerunner of Big Bertha is called "Dulle Griete," which translates as "Black Maggie."

Bronze pieces of the same caliber were cast for the Turkish stronghold of Constantinople very shortly after "Dulle Griete" was born in Ghent. One of them is in England now.

Probably the biggest-calibered ordnance ever produced were some 30-inch smoothbore mortars which Alfred Krupp cast in 1871, intended for the siege of Paris. The German General Staff, however, decided not to use them.

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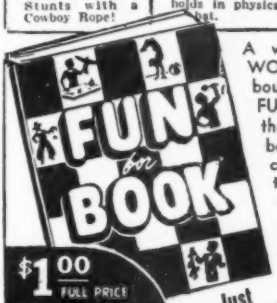

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[*Continued from page* 67]

in the Marine Biological Laboratory itself. During a normal summer these workers will average about five hundred in number. During one especially active summer they dispatched the astonishing number of 62,000 sea urchins, plus other specimens in proportion!

It is the prickly little sea urchin that seems consistently to top the list in marine specimen demand, both among summer workers in Woods Hole and researchers at inland points. Minnows also go well; they are simple in structure and easily handled. Dogfish are always wanted. For squid the yearly demand is about 5,000. Starfish move very much faster, the Supply Department catching and distributing about 25,000 of them in the course of a year.

Consider that figure. You or I might wade the tide-pools all day, even where starfish were known to be abundant, and perhaps would come home with two. They wouldn't help much in a big biology class. Collecting on a mass production basis is very different from our individual harvesting. The Marine Biological Laboratory's equipment is indicative of its scope. It includes a number of trucks, 15 boats, fish traps, seines, tangles, and dredges.

It takes a sea-going power boat equipped with mechanical hoist and a tangle really to mop up the starfish. Literally! A tangle actually is a glorified household mop, about six feet high and the same across equipped with a great many strands of frayed cotton. After being lowered to the bottom and trailed for a few hundred yards it is hoisted aboard. Starfish and other spiney creatures that have become embroiled in its strands are picked off one by one and tossed into a cask of water. Don't feel sorry for the starfish. They're as much of a pest economically as useful scientifically.

Whatever forms of bottom-dwelling life have been missed by the tangle are later picked up by the gouges of the dredge. Similarly operated by hoist and dragged astern, it digs in and scoops them up. As the bottoms about Woods Hole consist of submerged glacial morraine the dredge deals with a collection of rocks. These are brought to the surface in abundance; clinging to them will be sea urchins and other precious forms of life which are forthwith detached and saved. The rocks are returned to the sea to accumulate more.

For fish of numerous varieties and running to respectable size, set deep-water nets provide abundant hauls. Inshore, where minnows cavort by the thousands, a hand-manipulated seine is used. But the Cape Cod minnow is a lively mite and a certain seining knack must be applied. This consists first in knowing where to look and thereafter keeping the lower part of the net in close contact with bottom. Toward the end of the haul, a snappy landing is effected, with net sagging trough-like.

Indeed, all the variegated specimens entering the Supply Department of the Marine Biological Laboratory represent a well-founded knowledge of where to look and how to collect.

Order, please?

Ideas For Service Men

[*Continued from page* 139]

day or night. No longer may you warble—

"Some day I'm goin' to murder the Bugler—
Some day they're goin' to find him dead!—
Then I'll amputate his Reveille,
And step upon it heavily—
And spend the rest of my life in bed!"

Ah, no! Big Ben, or his little boy, Baby Ben, or little Miss Ingersoll Trinity, is likely to be, not merely your best friend, but probably your ONLY friend, on this kind of job . . . and there are a lot of detached duty jobs in this here now war! So, be assured that failure of your alarm clock to wake you, is an excuse which won't get by with the Old Man . . . so take counsel:—

1. Keep your alarm clock standing in one place, and in one position, and as little as possible exposed to dust and grit.

2. Wind (and set) it at approximately the same hour, morning or evening.

3. Don't expect chronometer accuracy; check clock daily with nearest dependable clock, or with radio time, if available; and set daily, if necessary. But *set it at same time you wind it.*

4. On West Coast, where changes in temperature are considerable, set clock where it will be in the shade, and in as even a temperature as possible, *all the time.*

5. Never strip your alarm clock, in the silly belief that you are qualified to repair or adjust it. Never attempt to clean it; and never oil it. Use it till it wears out, in a year or so, then buy another. The guys who made it know a lot more about alarm clocks than you will know.

6. Finally, plant that clock at some spot in the room where you'll have to "hit the deck" and walk a few steps to shut off the alarm in the morning . . . otherwise, you'll soon develop the habit of throttling it without ever waking up, and find yourself explaining (or *vainly trying to explain*) to some Gold Braid just why you weren't on the job when you should have been. Selah!

An ordinary snap-type mousetrap is part of a novel apparatus devised at the U. S. Bureau of Mines for collecting air samples in mines, manholes and other inaccessible places.

New Products And Inventions

[*Continued from page 175*]

New Rifling System

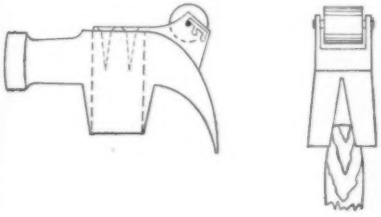
A novel system of grooves and lands in rifle barrels, the invention of Roy E. Carter of Niles, Ohio, is the subject of patent 2,293,114. Instead of the alternation of sharp-edged grooves and lands, or ridges, Mr. Carter's rifling system calls for very wide, shallow grooves with smoothly rounded bottoms, and low, obtuse-edged lands. They are more like fixed waves in the metal than like the "gear-tooth" pattern of the conventional rifle's cross section.

The inventor claims, as advantages for the new rifling system, greatly reduced fouling of the barrel, less likelihood of rupturing or stripping the bullet jacket metal, and higher velocity and greater accuracy for the smoother projectile.

For Steadier Machine Guns

A back plate for machine guns, claimed by its inventors to make for greatly increased steadiness in firing these chattering, jumping weapons, is the device put forth by W. G. McNeill and I. G. Boehm of Dayton, Ohio, who grant rights in their patent, No. 2,293,069, to the U. S. Government for manufacture and use without payment of royalties.

An essential part of the new invention is a set of recoil-absorbing springs, which take up much of the jolt and jar of the firing, which have in other types of mounts been imposed on the hands and arms of the gunner. The new design is especially well adapted, the inventors state, for heavy weapons like the .50-caliber machine guns.



Removing Nails Straight

With the metals shortage affecting supplies of usually plentiful and cheap items like nails, a hammer attachment which removes nails without bending them is interesting carpenters and workshop workers. Wheel-like, the attachment to the head is so devised that a nail is withdrawn as straight as it went in, and thus can be used again at once without delay, eliminating the unsatisfactory results obtained with crooked nails. The device has been patented by H. Archer of Toronto, Canada, under number 435,612 in the United States, 489,860 in Canada.

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Color Photos In Three Dimensions

[*Continued from page* 41]

sees a slightly different view of a subject. To prove this, hold the edge of this magazine about a foot from your eyes. First look at it with the left eye, then with the right eye. Notice the distinct difference, the solidity or depth, obtained by using both eyes. The sensation of depth occurs because both flat images seen from slightly different angles are fused into a single three-dimensional image by the optic nerve of the brain. Mr. Winnek's invention has put views from different angles on the same film.

Simple but ingenious part of Trivision is the film. It is ordinary film that has minute vertical ridges, 1/200th of an inch wide, each of which acts as a plano-convex lens, impressed on the side from which the halation backing is removed.

If you look at the emulsion side of a Trivision portrait through a magnifiying glass, you see each area of emulsion behind its respective lenticulation running up and down the picture. Appearing like a blur, each area contains a multiplicity of images constructed by its respective ridge-lens during the exposure. When you look at a Trivision portrait through the lenticulations, your eyes look at the same lenticulation, but each eye sees a different one of the many images behind that lenticulation.

As each image is a slightly different view of the subject, your optical nerve presents you with an impression of depth. A trick of the eye? Not any more than the normal performance of the eyes-and-nerve partnership. Mr. Winnek has just catered to them, that's all. When prints are obtainable instead of just transparencies, as is the case now, color stills will enter a revolutionary new existence.

As it is, looking at a Trivision picture of a man's open mouth can be an astonishing and amusing experience. The rear teeth appear to be on the film's surface, but the front teeth to project about four inches from the film. If you put a pencil point on a rear tooth, the front teeth seem capable of biting the pencil in half! Too, the throat looks as if it were about two inches behind the film, and it seems impossible to t o u c h the throat unless the pencil pierces the film.

To make a portrait, a piece of the special film is placed in a film holder and inserted into the sliding back of the camera. Correct lighting and pose are obtained, and the subject carefully remains still as the exposure is made.

Trivision portraits could be made in an ordinary camera if the lens were wide enough to gather views from the angles required. However, as it isn't, Mr. Winnek had to design a special scanning camera which does produce the necessary different angles of view.

The portrait camera is a simple box with an ordinary lens mounted on the front, a 45° mirror running the diagonal of the box, and a moving film carrier on the side. The mirror serves to make the camera smaller and also prevents the person in the finished transparency from being reversed from left to right. To make the exposure, the shutter is opened on time and a motor underneath the camera moves it about six inches in a line parallel to the subject. As the camera moves, the image also moves; therefore, a moving film holder is necessary to keep the image in register on the film. At the end of the exposure, the complete panorama seen during the scan of the camera has been recorded. The exposure is from four to ten seconds, depending upon conditions and the subject.

A knob and dial on the front of the camera comprise the "datum plane selector"—the datum plane is the plane of the subject which registers on the plane of the film. For example, in the portrait of the open-mouthed man, the rear teeth were on the datum plane because they appeared to be on the film's surface. When the picture was made, the rear teeth could have been made to project a few inches from the film, apparently, or set back inside the film, by adjusting the datum plane selector differently. By use of the selector, the subject in the finished portrait can seem to be either inside or a distance out from the film! The person's face can seem to project so much that when you view it the person's nose will seem to be right against yours. Or, the subject can look to be a yard inside the film. All this is accomplished on a piece of film 1/100th of an inch thick!

Remember that these unique impressions are received by the naked eyes without any viewing device whatsoever.

Next step, and the one which will really open up the future of Trivision, is paper printing of the portraits. They will probably be made by a scanning printer which will rephotograph a Trivision transparency onto special paper. Trivision has not yet been reproduced in publications, b u t experiments indicate it will be accomplished shortly. T h e r e seems ample reason for Mr. Winnek's promise that trivision will remodel the entire field of portraiture.

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Camouflage New Style

[*Continued from page* 45]

enemy may come nearer to our shores, permitting aerial reconnaissance in force.

To quote the United States O.C.D. manual on Protective Concealment, "the advice and assistance of a highly trained personnel should be secured whenever possible in the numerous instances where camouflage is a positive requirement."

Aircooled Tires

[*Continued from page* 39]

His conclusion was that the tires would turn at lower temperatures if the vacuum were broken. His first effort was a deflector installed at the lower outside edge of the body just ahead of the tires. This device, however, while it cooled the inside tire, increased the heat load on the outer wheel, due to the creation of a new vacuum.

The next effort was a funnel and pipe arrangement. The funnel was intended to pick up air from its position against the body of the truck, and conduct it through the pipe around the fender and into the vacuum. However, not enough air could be induced through the pipe by the funnel.

The successful experiment included the funnel principle, but on a larger scale. A hole was cut through the body directly in front of the fender, and a tapering metal channel bolted to the inside, leading directly to the area where the vacuum was developing. An air scoop was clamped to the outside of the hole on the body. That did the job.

On the first two-way test run over a 140-mile course, the inside duals on a truck equipped with the ventilators (which could be made of wood) ran 34 degrees cooler than a companion truck lacking the equipment. Both trucks were International K-10's, each carrying a 5,500-pound load, with all tires inflated to the manufacturer's specifications. Atmospheric pressure on this run was 95 degrees.

Two other test runs were made at other atmospheric pressures, with virtually the same results. The pressures are computed from the manufacturer's estimate that each pound of pressure generated on the road is equal to 8½° F.

Vance estimates the heat deterioration thus eliminated is equal to at least 5 per cent of the tire's normal wear. And while a 5 per cent saving might not have been of great importance in the pre-war days, it's very worth while under today's conditions.

Mercury, one of the United States' 14 strategic minerals, is used not only in thermometers, but also in paint protecting ships from barnacles, in milling of gold by the amalgamation process, for electrical contacts and numerous pharmaceutical compounds.

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The New Era Of Super Guns

[*Continued from page 61*]

thick jacket or a steel core—they would have done even more.

How did Gerlich manage to fire bullets of ordinary rifle size with such enormous muzzle velocities? Simply by using bullets that were large in the barrel of the rifle and slender after leaving it. While in the barrel they offered a large surface for the powder gases to push against. It was known for a long time that the powder gases emerged about three times as fast as the bullet, but there was little that could be done about it. Minor gas leaks, the friction of the bullet in the barrel, and similar factors prevented the projectile form attaining even approximately the speed of the gases.

Gerlich solved the problem in constructing a barrel .35 inches in diameter at the rear end, the front end only .25 inches in diameter, both joined by a conical center section. The whole, save for a small portion near the muzzle, was rifled. The bullet was a little under .25 inches in diameter, bearing two copper skirts which filled the rear end of the barrel. When the cartridge was fired the gases pushed against the large cross section provided by the skirts. Then the bullet entered the compression or choke section and the copper skirts folded back into recesses provided for this purpose. When the bullet left the muzzle it had an overall diameter of only one quarter of an inch, thus encountering much less air resistance than a .35 inch bullet would have encountered.

Major Glenn P. Wilhelm, U. S. Army, when describing this scheme in 1932, said that if somebody had submitted that idea to him on paper, he would have said that it could not work. If the skirts were strong enough to carry the bullet through the barrel, they would not fold back; if they were weak enough to fold back they would not be strong enough to accelerate the bullet; and if they did both they would fold unevenly and the bullet would not be true in the barrel, probably gouging it. But, he concluded, he knew that the skirts performed the way Gerlich had said they would.

In fact the skirts did not only all that, they also provided an excellent gas seal and caused little friction in the barrel. There was only one drawback: the compression barrel, consisting of three sections in one piece and being deeply rifled on the inside, was fantastically expensive. Gerlich of course was condemned to absolute silence when Hitler came to power in Germany. But ordnance experts in other countries made a suggestion which would not increase the efficiency of the gun, but greatly decrease the price. They suggested that the barrel be made conical all the way through and smoothbore. In that case the bullets would not spin and would need fins to keep them from tumbling in flight.

The Nazis seem to have followed that suggestion. The barrel of the "28/20 Pak" looks conical all the way and is probably smoothbore. And its bullets are probably slugs of solid steel with fins at the rear end. The whole seems to be seated in a copper cone bearing the two skirts. When the bullet undergoes the last stage of compression, the copper cone is deformed so that it falls off shortly after leaving the muzzle. The muzzle velocity of that gun is not known but it must be higher than that of an ordinary anti-tank gun, and the projectiles of the American 37 mm. anti-tank gun cut through 1½-inch armor plate "like butter" at 1,000 yards.

All of which means that tanks won't be able to survive if guns like the Gerlich anti-tank gun and the Halger-Ultra rifle can be produced in large quantities. An armored car weighing about 7,000 pounds carries some 1,200 pounds of armor, ¼-inch thick where heaviest. Armor-piercing .30 ammunition can still smash through that heaviest section at ranges up to 500 yards. Armor-piercing .50 bullets and all ultra ammunition will have no trouble going *straight through the whole car!*

Armored cars of 9,000 pounds carry about 3,000 pounds of armor, half an inch thick at its heaviest. This is still vulnerable to armor-piercing .30 bullets at 50 yards while .50 bullets can break through even at 1,000 yards. As for ultra bullets . . . just go back to the 1931 test reports. A 9-ton light tank carries roughly one ton of armor with a maximum thickness of ⅝-inch. While .30 ammunition is useless in this case, .50 bullets and ultra ammunition are effective up to 500 yards. A 15-ton tank carries some four tons of armor with a maximum thickness of ⅞-inch. Armor piercing .50 ammunition can just penetrate this thickness at close range and ultra bullets could do it up to 300 or 400 yards. Heavier tanks are invulnerable to any kind of portable rifle, but they are vulnerable to anti-tank guns, long-barrel 75's and Gerlich-type ordnance of cannon size. And they may well be vulnerable to an "ultra" machine gun.

High-velocity ordnance has another advantage. Gerlich took his Halger-Ultra and an ordinary German infantry rifle and sighted both of them at the same target, 1,000 meters (1,094 yards) away. The two pieces were clamped into position and light wooden screens were placed between guns and target, spaced 109 yards apart. Both rifles were fired. Measurement of the force of impact showed that at that range the Halger-Ultra bullet still had the same velocity as the other one *at the muzzle*. And in order to hit the target the ordinary rifle had to be elevated to such an extent that the bullet was 16 feet above its muzzle in the halfway screen. The ultra bullet was only 4 feet 1 inch higher than the muzzle. The trajectory was much closer to a straight line. And, needless to

The New Era Of Super Guns

say it needed only about half the time of the other to strike the target.

This speed is of great importance if it comes to anti-aircraft shooting. Bullets from ultra guns will be much more effective, not only because of higher reach and greater power of penetration, but also because they need much less time to ascend to the altitude of the plane under fire.

Projectiles fired by ultra guns are likely to be solid, unless cannon-size ultra guns are simply used as long range pieces. But it is almost impossible to shoot through a tank or through an airplane without doing some damage, even if the projectile does not explode. Tanks and airplanes will be the main targets for ultra bullets. In the one case the power of penetration and in the other case the shorter time of flight will be the decisive factor.

Gerlich was not the first to think of the principle used in the new type of ordnance. He was preceded by more than a quarter century by another German inventor, Carl Puff of Spandau. Puff took out several patents on such rifles and bullets in 1903. His guns were slightly conical all the way through, it seems, and his bullets were of many designs. Some had two high and narrow copper bands, almost like artillery ammunition, but these narrow bands were to be flattened out while traversing the bore. Others had a loose copper skirt all around the rear end of the bullet. But Puff did not carry his compression far enough. His bullets were only about 20 per cent faster than ordinary ammunition. He had an ardent advocate in Col. Heydenreich, who held a responsible position in the Imperial Germany Army. But the suggestion was finally rejected—there was no need for faster bullets. There were, in other words, neither tanks nor airplanes.

Gerlich, in carrying the principle farther, succeeded in doubling the muzzle velocity. A general introduction of such ordnance would greatly extend the battle range of fighter airplanes, would make anti-aircraft fire much more effective, would make ground troops more deadly to tanks and tanks more deadly to each other. But it would not affect the ground troops so much. Their position would be greatly improved, as compared to armored columns and flying adversaries. This would finally result in a resumption of positional warfare, where the soil affords complete lateral protection and the curved trajectory weapon alone can be effective.

It all hinges on the one *if*—IF it is possible to manufacture ultra ordnance as fast as the ordinary type. Even though it's late, American mechanical ingenuity and experience may well provide an answer that will give our forces the advantage of multitudes of these super guns originated in a country now our enemy.

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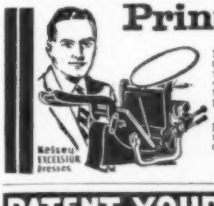

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